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ARE THE INDIANS DECREASING? IF SO, WHY?

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The growing interest in the condition of our aborigines, and the lack of critical information concerning their numbers and progress in civilization, must excuse an article on this subject. As an evidence of our lack of knowledge of the situation of our native tribes, we cite the conflicting opinions in relation to their increase or decrease in numbers. The old, prevalent idea that they are decaying is contradicted, and we are told by those who assume to know, that they are increasing in population. Equally diverse are the opinions as to their progress in civilization.

As the first question is one of figures and statistics, we should expect that there would be no great discrepancy in the statements of the various writers. The disagreement on this point is caused by the difficulty in obtaining the actual numbers of the wild tribes, and also in the hasty statements of popular writers. Let us see how the best statistics, official and otherwise, will settle this question.

Geo. Bancroft, in his History of the United States, places the whole number east of the Mississippi, at the first settlement by the whites, at 180,000. This is lower than the estimate of any other writer. Boquet, who traveled extensively among them in 1764, gives their number at that time, after many severe wars, at 283,000, in the "old colonies." By this term he included all the country claimed

by the French and English in Canada and Florida, as well as the thirteen colonies. Others, who had good opportunities to obtain information, estimated the original number at 300,000. If we take the lowest figures, those of Bancroft, we shall still see that the tribes formerly in contact with our ancestors have decreased, so that we have not more than one-fourth as many now living as the original number. Whole tribes have entirely disappeared. Others are represented by a few dozens of mixed breeds, without a full blooded Indian among them. Still, others, like the Cherokees and Creeks, have decreased very slowly.

If we take a few tribes and trace their separate history, this decay will be more clearly impressed. Thus, the Wyandottes were one of the powerful tribes when the whites first settled near them. In 1855 they had decreased to 554. In 1861, when the writer lived on their reservation in Kansas, they were less than 500. Of this number, not more than half a dozen were full blooded Indians. The latter were aged members of the tribe and have since died, so that now, there is not a full blooded Wyandott living. The census of 1875 gives the number of the tribe at 247, many of whom could pass as whites.

The Delawares afford another instance of a tribe which had been in contact with our race for over two centuries. The American Encyclopædia states that at one time they numbered 40,000. This probably included some tribes that were subsequently known under a different name. In 1855, the U. S. Report gave their number at 25,00. In 1861, when the writer first became acquainted with them, their official *annuity* number was 1,054. Of these, less than one tenth were of pure Indian blood. The U. S. Report of the Department of the Interior, in 1875, gives the number associated as a tribe, as only thirty. Some had probably gone to other tribes, and about a hundred of the whitest portion had become citizens of Kansas, most of whom pass as pure whites.

In considering the population of any tribe, one custom, universal among all the aborigines we have met, must be kept in mind, namely: that when a white man marries a squaw, he is counted as one of the tribe, and enjoys all the privileges of an Indian, even to his share in the annuities from our government. This was clearly illustrated in the portion of the Sacs and Foxes settled in Iowa. In 1873, the annuity was divided among three hundred and seventeen nominal members, while only eighty belonged to the two tribes, and many of these were of mixed blood, and quite a number "dissolute whites;" so that, not only the half-breed children, but even the white fathers are counted as Indians. This makes the apparent number greater than it should be, as half-breeds should in the census be divided between the two races.

The southern Indians, as the Cherokees, Choctaws, Creeks, &c., present a more favorable condition of affairs than the northern tribes. They were originally more civilized than any others this side of Mexico and the Rocky Mountains. They cultivated more ground, had better houses and more native domestic arts than other Indians. Their numbers, reported at different periods, are more reliable.

The Creeks, when moved west, in 1832, were found by the officials to count 22,668. The official report of the Indian Departmant for 1857, gave 14,888, and that of 1872 gave 12,295. This shows a steady decrease, although all the half-breeds and many of the unmixed Indians had quite extensively adopted civilized habits. As early as 1832, they had so far conformed to our morals (?) as to own nearly one thousand slaves. We met, recently, some of this nation in Texas, without suspecting they were "Indians" till informed of the fact. How many of the tribe are of mixed blood we could not learn, but probably one half. To the white blood is due most of the advance they have made in civilization. Schoolcraft says the Creeks commenced their advancement in agriculture, a century ago, under the Scottish admixture.

The Cherokees are frequently quoted as an instance of advancement in civilization. A few facts will show how much may be credited to white, and how much to Indian blood. Their number, when removed west in 1837, was 27,000. Schoolcraft estimated their number in 1847, at 26,000, (including about 2,000 in South Carolina, not among those removed); and Catlin, about the same time, gives 22,000 and adds, that there was a large proportion of white blood. We know from other sources that whites had intermarried with them before the revolution. In 1853 the government report gave 17,367 on actual count, but since that date the reports give only estimates from 10,090 to 18,000, which would indicate that the number embraced in the tribe, though previously decreasing, has not varied much in twenty-five years. Of the present number it is exceedingly difficult to ascertain how many are of mixed blood. An intelligent half-breed, in whose house we were kindly entertained, and who could read and write easily, in both the English and Cherokee languages, stated that the full blooded Cherokees were not over 800. This was endorsed by a white man who had lived among them. Others estimated the number at 6 or 7,000. As they were scattered over a reservation one hundred and fifty miles long, and the pure blooded Indians were very isolated, we could not tell who was correct. The white blood has evidently checked the decay of the tribe. We were informed that there were over 2,000 white men and women intermarried into their nation, and from the number we met, we were satisfied that this estimate was not too large. We saw at the Indian houses more whites than full blooded Cherokees. At the first sight, this intermixture would seem to show a want of taste in our race, but when we recollect that a large proportion of the tribe has but little Indian blood, and are well educated, the objections vanish. The greater portion of these whites are men of good morals, intelligence and education. Their houses are better than the average of our western settlers. That the whites and lighter mixed population take the lead in farming and in improvements is easily seen. When we saw a large, well tilled farm, with good houses, we could easily grade the degree of white blood in the owner. Some of the pure Indians do indeed till the soil in small farms, but we were informed that their women assist in the field, while the half-breed squaws do not.

The better comforts to be found in the houses of the whiter portions of the tribe is very favorable to the health and lives of the children. This becomes another element in the preservation of the race, at the same time increasing the percentage of white blood.

Other tribes might be designated in detail with like results. Some are passing away rapidly and others slowly, but no tribe east of the Rocky Mountains, which has had official relation with our government, or come in contact with the whites, has retained its original numbers. The writer has been on the reservations of eighteen tribes, and on some of them very frequently. He has met members of other tribes, and from personal observation, and the official returns of Indian agents, he finds all decreasing. Of fourteen tribes, in whole or in part, on reservations in the State of Kansas, at the time of its organization, the average decrease has been about one-half. The Sacs and Foxes have only one-eighth of the number returned in 1835. This decrease has occurred, too, when all the tribes have been on the most friendly terms with the whites and with each other. No wars have taken place during that time. There has never been any trouble between the State of Kansas and any of the Indians on these reservations. They have been treated the same as white men, and when they have adopted our habits of life, they have been allowed to vote at the election of town and State officers.

Concerning the number of wild Indians, distant from our settlements, whose only visitants are exploring parties, we know but little. No reliable, positive information, fixing their increase, is known. In a few instances, we have reports of local epidemics which have made sad work. The Mandans, in 1837, lost more than nine-tenths of the tribe, from small pox, in a single season. Catlin mentions several instances where thousands were cut off in other tribes, by this and similar diseases. So far as estimates can be taken, in relation to the great body of the wild tribes, the evidence shows a decrease more rapid where they are in close contact with the whites, and less rapid where there is least intercourse with our race. Catlin, who lived with the wild tribes about eight years, in part from official reports, and in part from estimates, gives their number, in all portions of the United States, in 1840, at 400,000. McCoy made it less, but he puts 20,000 as the number within the Rocky Mountains, which we now know, was much too low. These estimates were made before the annexation of New Mexico and California. Schoolcraft, in 1847, gives 388,229, specifying the number in each tribe, mostly by estimate, and adds, that there may be 25,000 or 35,000 more in the unexplored regions of the United States. This includes 92,130 Indians in New Mexico, 32 231 "California tribes," not included in Catlin and McCoy's statements. This total addition of 124,361 by annexation, enlarging the official returns from Washington, is probably the cause of the prevailing opinion that the Indians are increasing. Fifteen years later, the official government report for 1855, gives figures for 314,622, and adds that the number may be as high as 350,000.

The report of the Interior Department for 1875, most carefully made in all its details, gives a total census of 278,963, by "actual count," excepting 50,000, which are estimated. This, too, includes all the mixed races as Indians, one-half of which should properly be counted with the whites. These various reports, though there may be some errors in the estimates, make it evident that the Indian race is, and has been for three centuries, steadily decreasing.

How much of the wasting away of our aborigines is chargeable to the white race, and how much to other inevitable causes, is not easily defined It may be truly said, that if the whites had never come to this continent, they would have been as numerous as ever. Yet, it will not do to say that our race had no right to come here, for this would be to decide that the civilization of the United States is a crime. Must the progress and arts of 45,000,000 be kept back, that 400,000 uncivilized may live undisturbed? The great majority of the wars between us, and the wide spread introduction of intoxicating drinks, must be laid to the criminality of the whites. Still, much of this decrease must be due to the inevitable, irrepressible conflict between civilization and barbarism. Most savage races have a persistent indolence and opposition to all changes and any adoption of the mechanic arts. That the white race is heavily responsible for their decrease and much of their sufferings, is quite apparent. But their want of progress in civilization cannot be chargeable upon us. From the first connection of the French and English with them, they have been offered the arts most appropriate to their wants. The blacksmith and wheelwright have been common appendages to the Indian Agency. Missionaries and teachers of all phases of Christianity have spent their lives to introduce our civilization and religion among them. Teachers have carried the spelling book and arithmetic; and the government blacksmith has offered to teach his art. But the Indian has made little progress in the first and scarcely any in the latter. The writer has had personal knowledge of about twenty-five tribes, some like the Cherokees, with a good reputation for progress, yet he has never found a full blooded Indian who had learned and practiced blacksmithing or any other handicraft so intimately connected with progress. This statemant is made after careful inquiries on the reservations, of teachers and agents. This we do not apply to the Indians of New Mexico and Arizona, as we have never been among them. They had a higher civilization before the whites came; raising cotton, which they wove into cloth, making good pottery and living in substantial houses. But they, however, show the Indian opposition to change; though they have domesticated our sheep and use the wool they weave their blankets, which are really a superior article, on their primitive frames, unwilling to adopt our more convenient hand looms. Their pottery is not different from nor better than that found in the ruins of their old villages, two or three hundred years old. Their houses are built on the same plan as when the Spaniards first saw them. Whether they have adopted the trade of the blacksmith, we do not learn.

This reminds us of a fact usually overlooked, viz: that the different families

of Indians varied much from each other in their domestic arts. The northern Indians, east of the Mississippi, raised corn, and some made pottery. Those between that river and the mountains, and extending to northern Texas, embracing the great Dakota family, had neither. Tribes adjoining, but belonging to different families, as Dakotas and Alonquins, each adhered to its own domestic arts. Even when an anomalous tribe, like the Mandans, had separated from its parent stock, and carried into new territory its original customs of log houses and large fields of corn, the surrounding tribes of a different family accepted neither. They showed the same aversion to adopt arts from each other that they have from the Europeans. The southern Indians wove cotton and the hair of different animals, but the northern Indians never learn to spin or weave, though their predecessors, the Mound-builders, made good cloth. This difference of original advancement in domestic arts, is closely connected with their rate of decay. Those families and tribes which had the least civilization, were the most rapid to decrease. The northern Indians have wasted the most rapidly; the southern tribes, the more slowly; while those in the southwest, who lived in towns, cultivated land by irrigation, made pottery and good cloth, have nearly retained their original condition. Even the best show so little disposition to improve, that Sparks said, twenty-five years ago, "No American Indian of unmixed blood, whatever pains may have been taken with his education, has ever been known to adopt the manners of civilized men, or to pass his life among them." If there have been any exceptions to this broad statement of the American biographer, they are so few that the fact is substantially sustained.

Why the Indian has not advanced, it is difficult to tell. Of his ability to do so, there can be no question. If he will apply as much industry and application to learn mechanic arts as he does in hunting and the cunning of war, he will succeed. The ability to compute numbers is considered one of the best proofs of intellect. Schoolcraft gives the numerals of several tribes whose systems go up as high as millions and trillions. If a tribe has no occasion to use numbers above a few thousands the ability to go higher is evident, when it retains a systematic computation which ranges far above any sums required in the ordinary or extraordinary affairs of life. All missionaries and teachers unite in saying that the young Indian of our mixed blood rapidly acquires a knowledge of arithmetic, as well as other branches of an education.

The greatest obstacle to progress is the inherent, constitutional indolence of the Indian. This natural trait, seen in all tribes, particularly those east of the Rocky Mountains, has been nurtured by the general custom of imposing all laborious duties on the women; even the cultivation of the ground appearing to have been their exclusive work. His pride looks on labor as the appropriate duty of slaves and squaws. From our first knowledge of the history of the aborigines of the United States, in all places and in all tribes, hunting and war have been his only employments, and the dressing of skins, with husbandry, and the practice of the few mechanic arts known to them, have been the exclusive duty

of the woman. His native and fostered pride scorns to perform menial duties. This has been the most persistent trait of his character. Herding cattle, he sometimes accepts. But we doubt if there is an average sized farm among the Seminoles, Osages, Creeks or Cherokees, who are the most civilized tribes, which is cultivated by the labor of a full blooded Indian man. The half-breed frequently excuses his wife from the field, but the true Indian does not. This aversion to labor, we once saw strongly exemplified at the Oto agency. Government distributes cattle at regular intervals, but the Indians declined to kill and dress them. We saw the Indians stand around in stately dignity while the white men slaughtered the animals and skinned the carcases.

The Indians on the reservations have certainly made more advancement during the last twelve or fifteen years than ever before. It is possible that our missionaries, teachers and agents have learned more correctly the best methods of reaching their susceptibilities. Capt. R. H. Pratt reports good success in teaching the Sioux, of unmixed blood, who are held as prisoners in Florida and at Hampton. It is probable that too little attention has been given to first civilizing the women. In all tribes they have shown a desire to adopt the dress of white women, and accept many of our customs. They freely learn and talk our language, while the men do not. They exert more influence in the tribe and possess more of "woman's rights" than is generally supposed. These points were recently illustrated among the Pottawatomies. The "prairie band" of that tribe, composed largely of unmixed blood, have lived apart from the whiter portions, and resisted all attempts at innovation, and particularly the establishment of a school. After a failure, an old squaw told the missionary teacher that he had begun wrong. That he must go among the mothers, and with their consent, which could easily be obtained, the object would be secured. He followed the advice, went around to the mothers, and obtained their promises that the children should attend, and when the time came, the school was established and became a success. The women clearly see the advantages of civilization as their labors are relieved and their comforts are increased. Women in all ages, have gained more by the arts of civilization than men.

While hoping that the future of the Indians may be more progressive than in the past, the facts come strongly back to us that their progress during three centuries has been slow, and nearly all of that progression has been in the mixed portions of the race. The official reports of 1875 give a total number of schools among them of 329, of which the Cherokees have 70, or nearly one-fourth. A large portion of the remainder are in the tribes long subdued and much mingled with the blood of the white race. Still it is the duty of our government, as we have taken their lands, to do everything possible to prevent their extinction or decay, and make every effort to give them the advantages of a civilized christianity.

BRITISH IMPERIALISM AND THE AUTONOMIC RIGHTS OF RACES.

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I. *State Papers of the Hon. Wm. M. Evarts on the Fisheries Question.*
II. *Speeches of the Rt. Hon. W. E. Gladstone, and Articles in the "Nineteenth Century."*
III. *Speeches of the Earl of Beaconsfield at the Mansion House and in Parliament.*
IV. *State Papers of the British Secretary of State for Foreign Affairs.*
V. *Papers in the Kansas City* REVIEW OF SCIENCE AND INDUSTRY, *by Dr. A. H. Thompson.*
VI. *Articles in the Kansas City "Journal."*
VII. *Articles in the London "Times."*

The period of decentralization which culminated in 1848, has been succeeded by a centralizing movement which has advanced with such accelerated force as to attract the attention of those who apply their minds to the problems of social science. This movement is only in accordance with the immutable law that governs all things, from the ever-varying forms of matter to the higher walks of human thought and impulse. Synthesis and analysis, building up and pulling down, joining together and distributing in a ceaseless round, obeying the law that is the very nature of things, and which has wrought out from chaotic darkness and silence, formless but teeming with tireless forces, this fair earth to be the home of man, glowing with beauty, vocal with music, and peopled with progressive beings whose capabilities know no limit.

Careful of matter, not a particle is lost. Not a blade of grass, not an atom of dust, not even a formless vapor, but in its new combinations contains the conditions of life, which may be called the complement of matter. Without both neither could exist, and it is this duality of nature that made what we call creation possible. Underlying all the forms of matter, teeming with restless life and all the processes of the mind, with their far-reaching analysis, is the law of progress. No change can take place without coming nearer perfection; no thought can advance beyond previous thought, without approaching nearer to ultimate, absolute truth; error is eliminated, and that which is pushed aside and destroyed becomes the *debris* of the ages.

Man, whether produced by creation or evolution, was a unity. Races were a subsequent growth, a result of the law of decentralization, necessary at the time, perhaps, for the expansion of the original family, but which must disappear, in the final result, the equality and re-union of the whole human family, which has long been the brightest dream of Philosophy and the most earnest hope of Religion.

Humanity is greater than man. Races, considered as such, are still less than man, and to them belong no rights; all that constitutes a race, and much

more, is included in the grand whole, as expressed by the first term humanity. Of all these rights, to the fullest extent every individual is an equal inheritor.

In political and social science, mankind must be considered as a whole, possessed of a common origin, and in the abstract positively and absolutely equal. It was so in the beginning, but with the principle of analysis, of decentralization, at work. As progress advances, the principle of unity prevails. Races will disappear, and the individual will be regarded as a part of the whole, and not of a mere section. By cutting the human family up into sections and drawing around them lines of demarcation, the errors of each would be perpetuated and intensified. It is only by contact, that error and wrong can be destroyed and truth finally prevail.

Two nations, but one people, standing in the very front of progress, the advance guard of humanity, are living examples of this doctrine. One of them, but an hundred years old, young, vigorous, aspiring and intellectual, has, within these few years, blotted out the distinction of race, that was her inherent weakness. The other, parent of this bright daughter of promise, with the accumulated wisdom of a thousand years, but yet with all the vigor of youthfulness, has stretched out her arms, until her rule embraces every race into which the human family is divided, planting among each, as soon as the people are fitted for them, the same institutions, the same nurture, that made her peerless daughter so glorious and so beautiful; and, reversing the order of the title of this paper, it is her Imperialism that I am preparing to consider.

Reference has been made to Christianity: that, according to the rule laid down in the New Testament, races should be preserved intact, without interference, their autonomy respected and preserved and their rights clearly defined by treaties and mutual agreements. Let me give this proposition a moment's consideration.

Jesus was a Jew—an inheritor under the laws of the Old Testament of the conquests of Joshua. Now how did Joshua treat the nations among which he came, as advised by Moses and Aaron, who professed to speak the words of God himself?

Was the autonomy of these races respected? The very reverse was the fact. They were cast out and destroyed, utterly and completely. The New Testament contemplates and teaches the same course, only the force is moral instead of physical. The New Covenant did not mean any less opposition to error, only the means used should be different. It was not contemplated to stand aloof from the nations, but to mingle with them. The command is clear and explicit: "Go ye *into* all the world and preach the gospel unto every creature." The wheat and the tares were to grow *together* in the field until ripe, when the tares should be burned with fire. Every tree that brought not forth good fruit should be hewn down and cast into the fire. The end was the same as that which Joshua wrought out, but the weapons were spiritual, not carnal. The destruction in the one case was men, in the other that which impels them. The whole general teaching of the

New Testament points to the time when error shall be destroyed, not by keeping aloof from it, but in that conflict of forces which is the visible manifestation that the law of progress is at work.

It will never do to judge of a whole by taking seemingly isolated parts. No one mind can comprehend even the events of its own time, and it would be utterly powerless to grasp the whole history of the past. But a single point in the march of ages is presented at once. It is assumed that there is a guiding hand, and that which seems to us at the time weakness and contradiction, which seems heartless and cruel, is in fact but part of what will be ultimately a perfect whole.

If we should judge Christianity by the thoughts and views of the disciples—their longing after rewards and honors, the betrayal of their Master, denying him in his extremity and forsaking him in his peril; if we take the Master himself, praying in Gethsemane that the cup, which was already full and pressed to his lips, might pass from his trembling hands; or in the agony of the cross, when he cried, "My God! my God! why hast Thou forsaken me!"—its perfection as a system would sink into nothingness, and the skeptic would indeed triumph.

Centralization is not common alone to the British Empire. Within the last twenty years this country has spent millions of lives, and thousands of millions of dollars, to preserve the Union intact and to blot out the distinction of race. True, state rights are yet feebly contended for, by a section of a party, but their doom is sealed, and the merging of the whole supreme governing power in the central government is only a question of time. In Europe the movement was given form and shape by Count Cavour, in the unification of Italy. What Napoleon indicated in 1805, and which he then thought it would take twenty years to do, was finally accomplished after more that fifty years. The old forms had to be broken down. All Europe had to be trodden as in a wine-press, by the iron heel of the man of destiny. The old crystallized forms of despotism had to be crushed to atoms. The people had to be taught that kings do not rule by divine right. The new elements had to assume form and take upon themselves perfect growth. Italy was then ready for the master mind of Cavour.

Bismarck followed in his footsteps, and the same tendencies of the age consolidated the German Empire. Why, then, should men wonder that England is confederating her colonies and arranging the boundaries of her Indian Empire? Why should there be surprise because she is marking out more securely and permanently the tracks and landmarks of her vast commerce, and drawing together, by the bonds of common interest, her far-reaching empire, upon which the sun never sets? In the vanguard of progress, she cannot do otherwise, and the moment she ceases to lead, her prestige will depart and her star will set in darkness and gloom.

In what sense is the English an imperial people, for the government is only the reflex of the will of the people, and Beaconsfield is only an agent who declares the will and obeys the behest of public opinion? The Jews gave the world faith and theology, the Egyptians science and architecture, the Phœni-

cians trade and commerce, the Grecians civilization and the arts, the Romans laws and jurisprudence, and the English civil rights and representative government, and not only have they given the world these, but they became specially the depository of all the rest. If a nation or a community excel in a particular thing, the comparison is always made with the English. Any specialty in manufactures is forthwith compared with what the English have done in that direction. If Prescott or Bancroft writes a history, it is compared with Gibbon or Macaulay. Poetry that approaches Shakespeare or Milton is thought to approach perfection. So completely is England now the center of trade that Mr. Evarts, in his "Trade Relations," says that a San Francisco merchant must provide himself with English exchange in order to buy a bill of goods in China or Japan. Ask any whaling captain what money he uses in his three years' voyage to the out-of-the-way places of the world, and he will tell you "Exchange on England." How proud the manufacturers of this country were when they could, without any tariff being in the way, undersell the English in their own markets; and we do not forget that we, on our virgin soils, can produce provisions cheaper than she on her rent-burthened fields. She is imperial in this, that she opens her gates and invites the competition of all the world.

But the charge is made that she is aggressive; that her flag is in all lands; that she is absorbing territory in every quarter of the globe, and that the autonomy of the native races disappears in her presence, that they are pushed aside and trodden down.

Now, what are the facts? In planting colonies, the English people have ever been in advance of their government. We in this country, on national days, have a fashion of saying that the "Pilgrims" came in the Mayflower for conscience sake. Sometimes, when nothing harder can be said, some of the States are taunted with having been penal colonies. I shall not attempt to settle this dispute. But, for whatever cause they left England, they brought charters with them, conferring powers of self-government, of which our splendid institutions are but a larger, perhaps a more perfect growth. The French had the St. Lawrence and the Mississippi, the two largest rivers; the Dutch had the Hudson, next in importance. Both these nations planted the feudal system, instead of representative government, the last remnant of which was extinguished in Lower Canada in 1844. The representative form, the truly imperial government, has triumphed over all the others, pushed them aside and destroyed them, leaving only the fittest to survive and go onward to perfection.

In India the merchants and traders, the people, went first. They formed settlements, they built forts, they raised armies, they did, apparently, a world of harm; but the imperfect civilizations of Brahma and Mohammed had crystallized. The Shaster and the Koran were finalities. They admitted of no farther advance. "The laws of cast and the chains of creed" had to be broken, and this could not be done except by impelling a better and a stronger civilization against the old. That wrong was done, needless wrong and that which should not have been done,

no one pretends to doubt. That the people of India were badly treated, between the native princes and the East India Company, is not disputed. Mr. Burke's speeches at the trial of Warren Hastings have placed these facts forever on record.

The British government at length extinguished the power of the Company, and commenced in reality the task of governing India. An hundred years have worked great results. India is now governed to a great extent by means of the native princes, but their expenditure is reduced within certain bounds. Except in the Vale of Cashmere, they have no power of taxation, and so much has the ruler of Cashmere abused this power that the British government is about to purchase his rights, and so relieve the oppressed people. And slowly and gradually, but surely, industries are taking form. The principles of law and justice are being introduced. The people are protected, and the administration of these native princes is directed by an English resident at each court, and the whole of the people are being surely taught the meaning of law and order, instead of arbitrary rule and violence; and the time is rapidly approaching when the poor ryots of India will exercise the franchise as freely as the free born American citizen.

Trade is as free to the merchants of New York as to the merchants of Liverpool. The tariff of India is for revenue purposes alone, and the taxes thus raised are all spent there. The finest system of railways the world has ever seen is being built with English capital. And these wretched people, depressed and ruined by four thousand years of misrule, are rising up to the dignity of manhood.

Juggernaut is in ruins. The funeral pile will be lighted no more forever, to consume the living and the dead. The sacred Ganges no longer receives the living sacrifices of helpless age and wailing infancy. Caste is rapidly passing away, to make room for that equality which is man's birthright. Woman is emancipated; and, from the mouth of the Indus to Siam, from Cape Comorin to the Hindu Koosh, life and liberty and property are safer to-day than in our own hapless desolated South.

In her resistance to despotism, India is to-day Britain's strong right arm. When the iron-clads passed the Dardenelles, and the swarthy sons of India swarmed on the battlements of the Knights of St. John, the world beheld the spectacle of the descendants of the men who checked the career of the Macedonian conqueror marshaled to check the triumph of another Alexander, and to defend the homes of degenerate Macedonians. When Turkey, prostrate before the colossus of the North, besought the aid of Beaconsfield, British Imperialism granted the protection desired, only on condition that slavery should be abolished, that justice should be administered, and that taxation should be re-adjusted, so that the people should be no longer plundered.

In the treaty of San Stefano, Russia missed her opportunity. But how could she do for others what she has never done for herself? There is no fine-spun theory about this. The ruling class in Turkey had to be thoroughly crushed,

completely humbled, before they would have asked for help, before they would have consented to inaugurate these reforms. And thus, out of the seething flames of war, from the ashes of the dead, is arising the Phœnix of Progress.

It is too much to say that the evils attendant upon the British conquest of India overbalance the present good, and they are but the dust in the balance in view of that which, in the very nature of things, is in prospect. The gain is all to these downtrodden, crushed millions, and the loss was as much Britain's as theirs. Her best and bravest sons have laid down their lives in this old, historic land. There is not a resting place for the dead in all the islands of Great Britain and Ireland from the consecrated fane of Edward the Confessor, the British Valhalla, to the humblest God's acre, but in which may be seen tablets placed by loving hands in memory of those fallen on the blood-stained plains of the Orient.

In South Africa, from the Cape of Good Hope to Aden, and along the shore of the Red Sea to the mouths of the Nile, nearly one-third the circumference of the earth British Imperialism stands face to face with the last stronghold of savage life. When Egypt, three years ago, asked the guaranty and protection of England for her occupation of what is known as the Somoli country, protection was promised on condition of two free ports being established opposite Aden. The effect of this is, that these free ports are fast becoming great centers of trade, where the ships and merchants of all the world may come on equal terms with the merchants and ships of England.

Particular stress is being laid on the Zulu war. Does any sane person suppose that the condition of the Zulus could have been improved without the power of Cettawayo being broken? The result of the war places the Zulus in a far better condition than they ever could have arrived at by their own exertions. I do not propose to enter into the causes of the war. The London *Times*, the ablest, the most earnest and most consistent supporter of Lord Beaconsfield's foreign policy, puts the defense of the Zulu war solely on the ground that Britain must protect her people, wherever in savage lands they may be found—a duty which from the time of her earliest colonies she has observed—and that, in the opinion of the Governor of Natal, war was inevitable.

Six months ago no Zulu could marry until he had killed his man in battle, and when he did marry his home, his wife and his cattle, all belonged to the king. When Cettawayo's power was finally broken, the poor creatures asked for a white king. This was denied them. They must be governed by their native chiefs; but they were told that a white man would be left with each chief, to teach him how to govern, and in the meantime they could marry when they pleased, and their wives and their homes and their cattle should be their own. In the war, the English suffered as much as the Zulus, and no one will dispute but that the advantage is all with the savages—families, homes, the liberty of their persons and the rights of property!

It took the British people a thousand years to grow up to the rights the Zulus have acquired in a single month.

In the title a reference is had to the press of this city, as typical of the press of this country. Grave misapprehension exists as to the status and power of what are called "colonies," or "dependencies," of the British Empire. They are not dependencies, but parts of a great whole. Within their particular spheres, the power of each government is supreme. This is fully exemplified by the answer Mr. Evarts received to his demand that the Fisheries dispute should be settled without reference to the Dominion government. He was told that this could not be done. That the rights to the fisheries belonged to Canada, and that the Imperial government could not touch them without the consent of the Dominion. These are not powers peculiar to this confederation, for New Foundland is not yet included in the Dominion. It is yet a separate province, and this so-called Imperialism declines to allow the treaty of Washington to override the municipal laws of this humble province in what was called the outrage of which Mr. Evarts complained.

With British Imperialism, the legislatures are supreme, and the treaty-making power is subordinate to them. In Britain, the power of the Executive has been carefully defined. The power and the privileges of the Peers have been defined and hedged in in many respects; but the power, the privileges and the prerogatives of the Commons, the people's branch of the government, have never been defined, and it is safe to say that while British Imperialism lasts they never will be. The British Empire is now in the full vigor of usefulness—blooming only to decay, unless it contains within itself that vitality which alone can make it keep pace with the progress yet to come. As she goes on, the trail of the serpent grows fainter and fainter; but if she stop and look backward, another will take her place. And then, will America be prepared for the task.

PHYSICS.

MAGNETIC SURVEY OF MISSOURI.

BY PROF. F. E. NIPHER, ST. LOUIS.

At a meeting of the St. Louis Academy of Science, held October 6th, the writer gave some of the results of his Magnetic Survey of Missouri. It is found that the lines of equal variation exhibit remarkable flexures, which are attributed to the influence of rivers. This confirms an observation made by Prof. Hinrichs in the previous year (1878).

Prof. Hinrichs had detected these irregularities during the previous year, but his stations were so few in number and so widely separated that he did not feel perfectly certain of the fact. The survey of Missouri was begun during the same year, but as we aimed to work up each section of the State thoroughly as we

went along, the work of the first year did not reveal these irregularities. During the past summer the work has been pushed south of the Missouri River, and the evidence on this point has been placed beyond all question.

The explanation which Prof. Hinrichs gives of these irregularities is contained in his "Theory of the Magnetism of the Earth," published in Copenhagen, in 1860.

His hypothesis is that the earth's magnetism is due to the motion (rotation and translation) of the earth in ether, thus giving rise to ether streams in the earth, and he then predicted that ocean currents, by virtue of the motion of the water, would, when properly directed, accelerate or retard the ether stream, thus increasing or diminishing the magnetic intensity. The same explanation he now applies to rivers.

My own explanation is as follows:

Without making any assumption in regard to the cause of the earth's magnetism, but assuming the existence of earth currents of electricity, they distribute according to well known laws, flowing in greatest quantity through the lines of least resistance. The magnetic needle tends to set at right-angles to the current, following the well known law enunciated by Ampere. Where the general direction of the moist river valley is at right angles to the normal position of the magnetic needle, the position of the latter is not changed. Where the river runs at right angles to the earth currents, no component of the latter is deflected up the river, and here, also, the needle assumes its normal position.

At Jefferson City, a line of stations running from a sand-bar in the middle of the river, back into the interior (to the southwest), showed the local effect of the river itself, and gave a change of ten minutes to the mile. The fact was also brought out that the lines of equal variation along the river at this point consisted of closed curves, or ovals. The form of these curves has not been determined. It is thought that valuable results could be reached by making a careful survey of any one of the river counties, making magnetic determinations every half mile. The work of the government surveyors would here be of great value, but for the fact that a large part of it has been done in such a manner as to make the whole entirely unworthy of attention.

Arrangements are now being made to study the earth currents direct. It being impossible to secure the proper conditions on telegraph lines, we intend to build short private lines, grounding the ends, and measuring the intensity of the currents which flow through. One mile of east and west line, and one of north and south line will be built at some river station, while another set of lines will be built on the high region to the south — probably at Springfield.

WASHINGTON UNIVERSITY, OCT. 10, 1879.

AERIAL NAVIGATION.

DIXON.

The science of Aërial Navigation has for many years perplexed the minds of aeronauts, not scientific men, but this perplexity need not be of long duration. A little reflection upon the principles which should govern the form of the vessel to be used, and the density of the atmosphere, would be sufficient to show its absurdity. When we consider the velocity which aërial navigation must attain, we can find no better illustration than the fish. Look at the velocity of the bird. Now, I may ask why does not the fish swim faster than the bird can fly? Because of the greater density of the fluid in which the fish lives. Then what is the difference between the density of air and water? Air weighs 31-100 grains to the cubic inch, while water weighs a little over 252 grains to the cubic inch. This is shown by the barometer at 30 inches, and the thermometer at 60° Fahrenheit. The difference between the density of these two bodies is over 251 grains. Now, suppose the fisn can swim eight miles an hour in the water, which becomes a resisting force to his fins, then how fast must it fly if it were placed in the atmosphere, to make the air a resisting power? Just the difference of the density of air and water multiplied by 8, the distance the fish would swim in an hour in water. This would give the speed of the fish in its aërial flight at 2,008 miles per hour. This is a mathematical demonstration which aërial navigation must approach before it can be made practical to overcome any current in the upper sea. If the vessel has not the power to sail by the compass and chart, of what use would be the ship? She *must* stem the tide. This calculation is based at the surface of the earth, but when we ascend 14,000 feet we find the density of the atmosphere only one-half the density at the surface. Then the speed of the ship would have to be increased to about 4,000 miles per hour. But aërial navigation need not be over 8,000 to 10,000 feet above the surface of the earth, which would only increase the speed to about 3,000 miles per hour.

How could human life be sustained at this velocity? Now, if we can obtain this velocity, then we must build a vessel somewhat in the form of the fish, and so equally balanced and buoyant as to float in the atmosphere at the surface of the earth. About one-third or more of the upper portion of this boat must be capacitated to hold gas sufficient to float it when laden. This will correspond with the air-sacks in the back of the fish. Now, with sufficient power to drive the fins and direct the rudder of the ship, we are ready for our journey. Starting from Topeka, Kansas, St. Louis, Cincinnati, and Pittsburg would only be flag stations on the line to New York. Then Paris, Constantinople, Canton, and San Francisco, then Topeka again; the journey of a day.

When a velocity has been attained that will overcome the upper currents, and the physical man can endure it, then we may expect a new era in the world's history. But where are Donaldson, Colgoove, and Wise? Their fate, with that of many others, prove the folly of aërial navigation with the balloon.

ENGINEERING.

GEOGRAPHICAL ENGINEERING—ANCIENT AND MODERN.

Inundating the deserts of Sahara and Arizona, piercing with ship-canals the Isthmuses of Suez and Darien, changing the course of the Oxus from the Aral to the Caspian Sea; these are what a writer aptly calls geographical engineering. That the completion of these undertakings will work important geographical changes is very true, but that geographical engineering is something characteristic of the boldness of modern enterprise, as the writer in question assumes, is not by any means true. The oldest engineering of which we have any knowledge was intensely geographical in its effects—was, indeed, the only foundation of the earliest known civilizations. Ancient Egypt, with its 7,000,000 of people, 20,000 cities and overflowing granaries, was the creation of the engineer. Its first recorded king, some 4,000 years B. C., came down the Nile to the head of the Delta to build him a new capital. Not finding a site to suit him, he made one by changing the course of the river, an engineering feat which forms a very respectable introduction for the first historical man in the world. Under his successors, able engineers made Egypt what she was under the later Pharaohs. They dug reservoirs for retaining the water of the inundations, to be used after the subsidence of the river, and for its proper distribution the country was covered with a net-work of canals. Some of those reservoirs, such as Lake Mœris, 400 miles in circumference, were works, at the mention of which, modern engineers stand aghast. The cities and cemeteries were located on the edges of the desert, and a perfect system of irrigation produced that marvelous vegetable growth in the river valley between them which was the wonder of the ancients. But the works of the old engineers have mostly disappeared, and Egypt is what we now see her, much more strongly resembling the adjacent desert than the Egypt of Rameses.

The Mesopotamian plain furnishes a still more notable instance of geographical engineering. Ancient Chaldea, now a desert, was once a land of plenty. The skill of her engineers alone gave her people a local habitation and a name. Their works were planned on a scale, and executed with a boldness, which modern engineers are slow to believe. Canals 400 miles long, so large as to be called rivers, and whose remains attest that the name was not misapplied, and reservoirs which rivaled Lake Mœris in magnitude, watered and fertilized the ground, which produced an hundred fold. But the works of the old Chaldean engineers went to decay, and fruitful Babylonia became again a desert. That powerful empire, so long dominant in Western Asia, was the child of engineering; and when her people, either through stress of foreign invasion or domestic degeneration, or both, became unequal to the preservation of the great works which the old engineers had executed, she disappeared from among the nations.

The ancient Arabian Kingdom of Saba or Sheba, whose Queen visited

Solomon in the days of Hebrew glory, was the creation of engineering. A barren valley in the mountains which skirt the desert in Southwestern Arabia, through which flowed a torrent during the season of rains, was closed up by an immense dike or mole. This great structure was built of blocks of marble clamped together with metal, and cemented with bitumen. It was a hundred and twenty feet high, and the water which it intercepted formed a large lake in the valley above. The whole surrounding country was irrigated by water from this lake, and Saba became a name for all that was beautiful on earth. The most wonderful accounts of its riches and luxury were given by the later historians. Pliny calls Mareb, the capital, the mistress of cities and a diadem in the brow of the universe. An Arabian geographer says a good horseman could scarcely ride over the length and breadth of this cultivated country in a month; and the traveler might wander from one extremity to the other without feeling the heat of the sun; for the thick foliage of trees afforded a continual shade. The happy natives enjoyed among their groves and vineyards a peaceful security, clothed in embroidered garments of green silk, and rewarded with a double increase of their flocks and lands.

It is unnecessary to say that there are no such vine-clad fields and refreshing shade in Yemen now, nor does the earth contain a spot less likely to have produced them. After having stood 1,700 years, the great dike burst, and beautiful Saba became a desert. The great disaster is still an era in the traditions of the country. Although it occurred some 500 years before his time, Mohammed refers to it in the Koran as a judgment of Heaven. "Wherefore we sent against them the inundation of El Arem, and we changed their double gardens into gardens producing bitter fruit—this we gave because they were ungrateful." Mohammed was mistaken. The failure of the old engineering work had caused a great change in the geography of Saba—that was all. It is evident that geographical engineering, whatever may be the benefits which the world is destined to reap from it, is not exactly a modern institution. Our engineers may possibly surpass, but they ought not to rob the ancients.—*Globe-Democrat.*

THE AQUEDUCT OF SEGOVIA.

The great marvel of Segovia, the great achievement associated from time immemorial with the city, and blazoned in its municipal arms as its proud cognizance, is the aqueduct, or "Bridge," as it is called — a long double line of arches thrown across the ravines of the valley of the Eresma, and forming, as it were, a triumphal arch and gate of the city, as the traveler drives under it at the end of his journey from La Granja. It is called a Roman building, and attributed to Trajan, the Emperor whom the Spaniards claim as their countryman, but it bears no inscription, and apparently never bore any; nor does any record or hint occur in ancient writers, either of the edifice itself or of Segovia, that can furnish a clue to the date of the building, or the name of the builder. To doubt that the aque-

duct is a Roman work would be little less than heresy; yet there are some native critics who timidly, and, as it were, with bated breath, venture to suggest that its original design and construction, at least, may be anterior to the Roman domination of the interior of Spain, and that it may be claimed as the achievement of those Celtiberian or other indigenous races who, like the Etruscans, Ligurians, and other native Italian tribes, knew something about architecture before the Romans, and gave their masters some useful hints in that art in which they became so eminently proficient. This opinion is grounded on the fact that the Segovian Aqueduct is constructed of large blocks of stone laid one upon another, cyclopean fashion, without cement or mortar, in the style of which specimens remain in the walls of Tarragona, the huge stones in many instances underlying the layers of Imperial Roman masonry. Another argument urged in support of this theory is, that this aqueduct, although solid enough to have withstood the wear and tear of at least fifteen centuries, is by no means a "massive building," as the guide-books call it; it has nothing of the massiveness, loftiness, and grandeur of the arches of such aqueducts as strew with their ruins the Campagna of Rome, or the plain of Merida, but it is a light, airy, fairy structure, standing on very slender pillars, almost miraculously; and the wonder and beauty consist precisely in this, that the architect, whoever he was, contrived to give his work just the strength he needed to answer the purpose for which it was intended, grudging even one pound's weight of material which might give it an appearance of heaviness and clumsiness, and clash with the general look of the monument. So striking is this masterly adaptation, this perfect adequacy of the means to the end, so flimsy, fragile, and gossamer-like are the lines of this marvelous arcade, that popular tradition assigns it to a supernatural origin, the legend being that it was constructed in one night by the devil, enamoured of a Segovian damsel, whom he wished to save the trouble of carrying her pitcher up and down the stream to fetch water. The truth of the matter is that we are very much in the dark as to the development primitive art may have attained in ante-Roman times, among races flourishing under the blissful influence of these Southern climates. They have in Segovia a so called statue of Hercules in a convent bearing the appellation of *Casa de Hercules*, carved in all probability at a remoter epoch than any that can be assigned to the Aqueduct; and they have also two of these *Toros de Guisando*, of which Avila boasts four, of which there were sixty-three in the Peninsula in 1598, a number reduced to thirty-seven in 1820, and which have been a puzzle to the most learned antiquaries — carved masses of granite in the shape of quadrupeds, but worn so smooth and out of all shape by time, and by the inclemencies of the thousands of winters to which they have been exposed, that it has become actually impossible to ascribe them to any living species, extinct or living; and, though they are called "bulls," they are variously described as huge pigs, elephants, or hippopotamuses, or whatever else fancy names them. These specimens of rude sculpture — probably idols of a primitive race — are undoubtedly anterior to Roman times.

I could not hope to convey any distinct idea to the reader of the magnificence

of the Segovia Aqueduct, by the statement, borrowed from a very able monograph on the subject by Don Andrès Gomez de Somorrostro, to the effect that the water of the Fuenfria, running through the Rio Frio, was brought to it from the Guadarrama Mountains, over a distance of 10 or 11 miles, and that the aqueduct was made to go through several bends and turnings, to check the impetuosity of the stream, running 216 feet to the first angle, 462 feet to the second, and 937 feet to the third, where it becomes a bridge, spanning the valley from bank to bank, and resting at the end on the solid rock on which stands what is left of the battlemented walls of the town. The total length of the aqueduct is thus 1615 feet, and consists of 320 arches, which begin single and low, but rise gradually as the ground sinks, to maintain the level, and become double, one tier over another, as they vault over the gap of the valley, over the stream and the highway, all along the range that faces the traveler as he approaches to, and passes under it, entering the town. The three central arches are the loftiest, and rise at a height of 102 feet. These are on the nether tier surmounted by three layers of stone somewhat in the shape of a step, intended as a cornice to mark the locality of the town-gate, and over the step in one of the pillars of the upper tier are scooped two niches, with a statue of the Virgin in the niche looking to the town, and in the other at the back a nondescript figure that priests call St. Sebastian, but in which the Segovians fancy they behold the effigy of the Satanic architect of the bridge. No words and no picture could convey the impression wrought upon the traveler by the sight of this magic building. The whole structure is of granite, light gray, as found in the quarry, but turned by age to a light pearl and purple tint, glowing like jasper in the deep blue of this semi-Alpine Castilian sky. The blocks of stone on a near inspection seem to have been laid upon one another clumsily and, as it were, at hap-hazard, some of them so daringly jutting out and hanging over as to suggest the apprehension that the whole fabric may at any time collapse and slip down to the ground like a castle of cards. Yet the bridge has been standing, perhaps, 2,000 years, and looks intact; and the design, seen at a proper distance, is a model of ease and elegance, relying, one would say, on mere symmetry and balance for solidity. The stones rudely cut in large, long, square blocks, bear the holes of the iron clamps by which they were hoisted up to their places; they were worn smooth and almost round by time and storms, but sound at the core; and at the base of the pillars, as well as at various stages up the shafts, and at the turning of the arches, there are cornices of what seem to have been black marble, but now everywhere chipped and cracked, and almost altogether fretted away.

The Aqueduct is the only thing really living in poor dead Segovia; the necessity of securing a constant supply of better water than what flows between the ravines of the Eresma compelled the construction of this work when the place was a mighty city, and insured its preservation as the town sank year by year to its present forlorn and dilapidated condition. The Moors, who sacked the town in 1071, pulled down thirty-five of the minor arches, but the watercourse con-

tinued uninterrupted, the people contriving by woodwork to prop up the wooden trough or pipe running at the top. The dismantled arches were restored as much as was practicable, in the original style, in 1483, by Queen Isabella the Catholic, and the Aqueduct has suffered no outrage from that time. What is more properly called the bridge — *i. e.*, the double range of arches across the valley — escaped even the ravages of the Arab invasion. There is something exalting and flattering to human pride in the contemplation of this edifice, which, like the Pantheon at Rome, is between fifteen and twenty centuries old, and yet not a ruin. One dreams of the works of men that have risen and fallen in the adjoining city, while the aqueduct has been standing and performing the humble, yet vital, service for which it was intended, unmoved by the joys or woes of the population to whose most pressing wants it ministered. The ancient cathedral begun, it is said, in the sixth century, finished in the twelfth, where councils were held and kings were crowned, used as a fortress against ruthless enemies, and so ravaged that its Holy of Holies had to be removed to the spot where the present edifice rose in 1525; the Alcazar, till 1866 a masterpiece of Royal magnificence, now a mere wreck, destined to moulder on the ground to the end of time; the scores of churches, convents, sanctuaries, chapels, and hermitages, crowding the streets of the town and its suburbs, some of the Lord's houses now closed for want of worshippers, some of the fat fraternities dwindling in numbers and thinning in flesh as, if not in faith, at least the lavish charity of their patrons cooled and fainted; the fortress-palaces where proud nobles learnt valor and courtesy, then sulked and idled, and laid aside the energies and spirits which made them the bulwark and the scourge of their meaner countrymen — all that made Segovia in the middle ages, and unmade it in modern times — had its rise and fall, its life and death, during the long period since the aqueduct first threw the shadow of its aerial arches on the skirts of the rocks on which the city stands. Mighty Castilian kings, with their host of iron-clad warriors; the sweet and pious and thrifty Isabella on her palfrey, with her crafty Aragonese husband and her Cardinal-Minister by her side; the popular heroes, the rebels, Padilla and Juan Bravo; the sallow and gloomy Philip II., and, perhaps, Columbus and Cortez, and a host of minor notabilities, rode centuries after centuries under these arches. The records of great events — the long war against the Moors, the formation of the Spanish Monarchy, the extinction of the people's liberties, the expulsion of the Jews, the revolt of the *Comineros*, the decline of the national character, the repeated French invasions, and the re-vindication of the country's soil from the hated foreigner — all seem engraved on those slowly, yet eternally, crumbling stones, piled up by the constructive genius of a man who will be forever nameless. Those swarms of swallows and martins which hover on the wing in clouds about the lovely fabric, the shrieks of which are almost the only sound enlivening the air in the stillness of the summer sunset, have been there—they or their progenitors—ever since those arches were first bowed. The clay of their nests, hardened by ages, has clung to those stones since they were laid; generation after generation of these erratic

birds have come back year by year from remote regions to their favorite haunts in those stones, and have found their homes undisturbed season after season.—Special correspondence of *The London Times*.

GEOGRAPHICAL NOTES.

EXPLORATION OF CENTRAL ASIA.

A few weeks ago it was announced that the projected grand expedition of exploration to Central Asia, presided over by the Grand Duke Nicholas Constantinovitch, had been abandoned. This is not the case; the scheme of exploration has been greatly enlarged. Professor Sorokin, Botanist Pelman, Artist Simakoff and the Engineers Liapunoff and Sokolovsky have arrived at Tashkent, and other scientific and military members are on their way thither from Orenburg. Captain Zouboff, the commander of the naval section of the exploration party, instead of proceeding to Tashkent, has gone direct from Kazalinsk to Khiva, where he is making arrangements for the survey of the Oxus. In order further to make this successful he has taken with him a steamer purchased on the Volga at Samara, at a cost of 40,000 roubles. As originally arranged, the expedition will survey the railway route from Kazalinsk to Balkh via Tashkent; it will explore the course of the Oxus from Balkh to Khiva, and then will examine the ancient bed of the Oxus as far as the Caspian. The only point in the programme undecided is whether the Grand Duke Nicholas shall command the expedition or not.

Capt. Wm. Kennedy, who commanded the expedition sent out by Lady Franklin, in search of her husband, writes as follows in reference to the selection of men for the American expedition to Lady Franklin's Bay, in 1880:

"The men I would call the right sort for Arctic work, would be medium sized, strong, wiry, resolute, good-natured, musical, orderly, self-reliant and self-controlling men—men, for instance, that could deny themselves even tobacco, that prolific source of suffering from thirst in a region where the temperature exacts such an amount of vapor from bodies that require a constant supply rather than its continual waste.

My men suffered more from this than from frost bites, whilst a non-smoker, like myself, never once suffered from this cause, or even from hunger, though daily on foot for over twelve hours at a stretch. I should also prefer men whose feet and hands did not perspire, to those that did, because being in circumstances where they cannot dry their socks or mitts, they are more liable to frost bites."

INTERNATIONAL COURTESY.

The Lords of the British Admiralty have given orders for the making of a handsome piece of furniture from the timbers of the old Arctic exploring ship Resolute for presentation to Mrs. Grinnell, the widow of the late Henry Grinnell, of New York, who fitted out at his own expense two expeditions for the search of Sir John Franklin.

AFRICAN EXPLORATION.

Orders have been sent by the African International Association to M Cambier, commanding the Belgian expedition, to push on 300 miles beyond Lake Tanganyika in a northwest direction, and establish a station at Niangwa, on the Lualaba or Congo. M Popelin, who commands the second Belgian expedition, which left Zanzibar about the middle of July, will found a station, the first of the series, on the eastern bank of the Tanganyika. Mr. Stanley is trying energetically to ascend the Congo. If he succeeds, he will meet M. Cambier's column, and the continent will have been completely crossed. Pellegrino Matteucci has landed in Naples on his return from his expedition to Abyssinia. He is to go to Monza to hand to the King of Italy the friendly letters addressed to him by King John, as well as the presents this African monarch has sent, and among which are two little tame lions. In November next, Dr. Matteucci will leave again for Central Africa, at the head of an expedition organized under the auspices of the Milan Exploration Society. He will once more attempt to cross the country of the Gallas, will reach Kaffa, explore the country inhabited by the small tribes who had not been visited on previous expeditions, and return to Europe by way of the Blue Nile.

THE DUTCH ARCTIC EXPEDITION.

The Dutch Arctic exploring vessel, the Willem Barentz has returned to Hammerfest, Norway, after penetrating as far as Francis Joseph Land. This expedition left Amsterdam on May 5, 1878, and touched at Vardo on July 19th, in order to land dispatches. The voyage was universally known as a "trial trip" The Willem Brentz passed Jan Mayen, Spitzbergen, and Bear Island, falling in with the "ice-pack" in latitude 78 deg., and though the weather was not favorable, many important scientific observations were made; a memorial stone was erected on Amsterdam Island, and a brief visit having been made to the Barentz and Kara seas, all that was possible, in the limited time at disposal, was done to advance the cause of science. The crew had a fine view of the whole island of Jan Mayen, a sight which few of their predecessors had enjoyed, the high land being, as a rule, shrouded in mist. The expedition returned to Amsterdam in the autumn of 1878, and money was again raised in the spring of that year, certain private persons subscribing, and the government affording no aid, toward a

refitting of the Willem Barentz. She is a small sailing schooner of eighty tons. She is commanded by Lieut. J. J. De Bruyne, a Dutch naval officer, with Lieutenants Koolemans Beynen and H. M. Speelman as second and third in command, with three or four scientific men and a crew of eight sailors.

THE NOVA ZEMBLA STATION.

M. Tyaghin, an officer of the Russian Navy, who went in July of 1878 to Novaya Zemlya with his wife, a child and three servants, to winter at the life-station organized on the Island, has just returned to Archangelse. All are well, and the little family has been increased by a new-born child. The winter was not severe, the greatest cold having been only —29°.1 Celsius; and on August 1, when M. Tyaghin left Novaya Zemlya, the thermometer rose as high as 16 degrees. The five Samoyede families who were sent to the same station are well, but one old man of more than sixty years, and two others, died from scurvy, and M. Tyaghin explains their death by the circumstance that they never went out of their dwelling and did not follow his recommendations. The hunting was good throughout the winter.

THE BENNETT EXPEDITION.

The following dispatch from Lieutenant De Long, commanding the Arctic steamer Jeannette, has been received at the Navy Department:

ST. LAWRENCE BAY, Siberia, Aug. 27,
via SAN FRANCISCO, Sept. 29, 1879.

Hon. R. W. THOMPSON, Secretary of the Navy, Washington, D. C.:—

Arrived 25th; leave for Cape Lodge Kamen to-night. All well. Natives report Nordenskjold passed south three months ago, stopping here one day, having wintered in Kalintchin Bay. Mentioned one officer, a Russian, who spoke the native language, as named "Charpish," possibly Lieutenant Rordquish, of the Russian Navy, accompanying Nordenskjold, who said the ship was going home. Leave here to verify account along the coast. Hope to reach Wrangel's land this season."

Conflicting reports are made as to the condition of the ice north of Behring's Strait, but the weight of evidence favors the opinion that the season is a good one for exploration in that direction.

CAPTAIN MARKHAM'S ARCTIC EXPEDITION.

A telegram from Tromso, dated September 22, announces the arrival there of the little Norwegian cutter Ys Bjorn, with Sir Henry Gore Booth and Captain Markham, after a satisfactory cruise. They met the first ice on the 4th

of June, at a distance of forty miles from the part of Novaya Zemlya coast called Goose Land. The Matochkin Shar was then impassable, and they therefore cruised along the west coast of Novaya Zemlya until they were stopped by the ice off Cape Nassau on July 15. They succeeded in passing through the Matochkin Shar on July 31, and found the Kara Sea full of heavy ice. Returning, they met the Dutch exploring vessel Willem Barentz on August 18. They then again shaped a course northward, along the Novaya Zemlya coast, and this time succeeded in passing Cape Nassau and in reaching Cape Mauritius—the extreme northwestern point of that land—on September 6. Finally they pushed northward on a meridian midway between Novaya Zemlya and Spitzbergen, and on the 12th they met the ice in latitude 78 deg. north, and longitude 47 deg. east. They passed onward and penetrated through loose streams of ice to 78 deg. 24 min., about eighty miles from Francis Joseph Land. A good natural history collection has been made, and further experience has been acquired respecting the ice in that sea which leads to the best Poleward route along the western coast of Francis Joseph Land. Captain Markham was to leave Tromso on the way to England on the 24th ult.

The September number of the Proceedings of the Royal Geographical Society contains Notes of a trip from Zanzibar to Usunbara, in February and March, 1879, by Keith Johnston; Notes on the Geology of Usumbara by J. Thomson, and an article on the origin of the Flora of the European Alps, with the usual synopsis of Society proceedings, &c.

THE NORTH-EAST PASSAGE.

Dr. Kar writes as follows in reference to the Nordenskjold expedition:

"I have read with deep interest and much pleasure the news in *The Standard* of this day of the completion of a distinguished Arctic explorer's great work, the effecting of a northeast passage, so long the dream and desire of many great navigators.

No man living was better suited to accomplish this grand undertaking than the distinguished explorer, Nordenskjold, full as he was of experience and sound judgment, with a magnificent intellect, stored with all the scientific knowledge requisite for bringing home a great store of useful and most instructive information.

Your article most justly classes this famous professor with the greatest of Arctic navigators; and the matchless Parry—were he alive—would, with the noble generosity that specially belonged to him, have been the first to acknowledge the fact.

Contrary to the probable general opinion, I think it quite possible that Nordenskjold's success may pave the way to the utilizing of this route as a short cut to the North Pacific.

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It obviously possesses many advantages over its great rival the North-West Passage, in futile efforts to accomplish which, England has squandered many hunded thousands of pounds on mighty expeditions, each costing five or six times as much as the compact and efficient one that has now done its work so well. The disadvantages of the passage northward of the American continent are, the numerous islands and lands that obstruct the route, forming narrow channels, all of which have been found blocked with close-packed ice, either at one end or the other, as, for instance, Prince of Wales' Strait, at the north end of which, an ice-block stopped M'Clure and Collinson's ships, and Victoria Strait, near the south end of which, Franklin's ships were crushed, and where I know from personal observation that the ice pressure is fearful. On the shores of Arctic America we have only one great river (the Mackenzie) which produces any important effect in breaking up and driving the sea ice far from land, whereas, from the coast of Siberia at least three very large rivers, the Obi, Yenisei, and Lena are doing a mighty work of destruction on the ice floe in spring and summer, cutting three great gaps, and opening up spaces of open water for the winds and waves to have free action on what remains unbroken.

The Siberian route is also much straighter and less incumbered by islands than that by America.

It also appears to me that, for some reason or other, no doubt a good one, Professor Nordenskjold deferred his departure from Gothenburg to too late a date, namely, 4th of July, for when he reached Waigat's Strait, he learned from vessels anchored there that the Kara Sea had been eight days free from ice, and therefore navigable. He waited here three days for his little consort, the Lena, so that he lost altogether eleven days of apparently open water, during which he might have been making his way east, and, if so, have accomplished his great work by passing through Behring's Strait in one season."

GEOLOGY.

THE ROSEDALE GAS AND COAL WELLS.

J. THORNE, M. D.

Over a year since the Kansas Rolling Mill Company began drilling for Gas at Rosedale (4 miles S.W. of Kansas City). The work having been abandoned by the Company was continued by private enterprise until four wells have been sunk with the results tabulated below.

The wells are all near the town of Rosedale, within the radius of a mile of each other; all are in the valley of Turkey creek. No 1 is at the mill, No. 2 is over ½ a mile nearer Kansas City, No. 3 is ¼ of a mile above the mill (s.w.), and No. 4, ¼ of a mile north of the mill.

	WELL NO. 1.	WELL NO. 2		WELL NO. 3.		WELL NO. 4.	
	ft.	ft.	in.	ft.	in.	ft.	in.
Surface dirt (loam, gravel and clay)	23	14	.	18	.	13	.
Limestone	40	5	.	21	.	20	.
Soap-stone	180	2	.	.	.	.	.
Black shale	. .	.	.	2	.	2	.
Limestone	8	10	.	15	.	5	.
Soap stone	. .	118	.	75	.	8	.
Limestone	. .	3	6	2	.	10	.
Soap-stone	. .	59	.	60	.	127	.
Limestone	. .	5	.	5	.	5	.
Coal	3	.	.	.	.	.	.
Black shale (gas)	. .	2	6	.	.	.	.
Soap and Limestone	. .	15	.	.	.	15	.
Green shale	20	.	.	.	.	.	.
Soap stone	. .	40	.	35	.	8	.
Black slate	6	.	.	.	.	.	.
Sand shale	. .	1	6	.	.	.	.
Soap-stone	20	9	.	.	.	.	.
Black slate	8	.	.	.	.	.	.
Limestone	. .	2	6	5	.	4	.
Soap-stone	. .	19	.	10	.	7	.
Green shale	20	.	.	.	.	.	.
Limestone	1	2	4	.	.	10	.
Soap-stone	. .	4	.	.	.	.	.
Black slate (gas 50 lbs.)	. .	1	8	.	.	2	.
Coal	5	.	10	.	4	.	.
Soap-stone	11	.	.	2	.	.	.
Fire-clay	. .	1	6	.	.	.	.
Limestone	. .	4	5	.	.	3	.
Sand shale (large stream of salt water)	. .	.	.	11	.	.	.
Black slate	. .	.	.	9	.	8	.
Limestone	. .	.	.	.	.	7	.
Soap-stone	. .	.	.	6	.	.	.
Black shale (80 lbs. gas)	. .	.	.	15	.	10	.
Soap-stone	. .	.	.	10	.	5	.
Limestone	. .	.	.	1	.	5	.
Soap-stone	. .	.	.	82	.	.	.
Black slate	. .	.	.	.	.	5	.
Limestone	. .	.	.	.	.	10	.
Black shale	. .	.	.	.	.	5	.
Limestone	. .	.	.	18	.	2	.
Black slate	. .	.	.	.	.	4	.
Soap-stone	. .	.	.	4	.	6	.
Limestone	. .	.	.	2	.	3	.
Slate (strongest gas)	. .	.	.	4	.	2	.
Limestone	. .	.	.	.	.	2	.
Grey shale	. .	.	.	.	.	3	.
Black slate	. .	.	.	.	.	2	6
Coal	. .	.	.	.	.	2	.
Soap-stone	. .	.	.	2	.	.	.
Sand shale	. .	.	.	16	.	10	.
Total depth of each well	345	320	9	430	4	330	6

The surface at Nos. 1 and 3 is about 50 feet above the Kansas City Water Works; No. 2 is about 20 feet less, while No. 4 is about 10 feet higher than No. 2.

The first thing which will be noticed in the above table is the great diversity in the Earth's crust, and this diversity constitutes the chief interest of the record. Thus the first limestone in No. 1 is 40 feet while in No. 2 about ½ a mile N.E. it is only 5 feet; at No. 3 ¼ of a mile in the opposite direction it is 21 feet, and at No. 4, between Nos. 1 and 2, it is 20 feet. Under the limestone comes soapstone. In No. 1 it is 180 feet, in No. 2 only 2 feet, while none is found in either 3 or 4 for some time. To a geologist the table will be full of such anomalies.

It is the object of this paper to present the facts only, leaving their analysis to others. The gas features of the wells are important in the relation they will sustain to economic questions. In No. 1 we find gas which burns strong from a 1 inch pipe at 274 feet, while 50 feet lower we have a pressure which could not be measured by the instruments at hand. In No. 2 we find it at 216 feet, and 92 feet lower we find it of 50 pounds pressure; (this pressure became much greater after a few days). In No. 3 we have a volcano. The flame, from a 3 inch pipe, is thrown over 20 feet horizontally, while from a 5 inch pipe it roars in a mass of flame 20 feet or more in the air. No. 4 is much the same as No. 3. The escape of gas is continuous and seems to increase after two month's time. It will be noticed that the gas always comes from the slate or shale formations.

The readers of the REVIEW may be interested in knowing how specimens are obtained from so deep a hole. The old method was by small particles brought up by the sand pump, but Mr. Charles Swan, the man in charge of the drilling, invented, for this occasion, a method whereby large pieces could be brought to the surface. First, a 3 inch hole is put down with a sharp drill, then a blunt instrument 5 inches in diameter, called a reamer, is put to work, carrying before it (in the 3 inch hole) a long cylinder or bucket, the rock as detached falls into the bucket and when drawn up shows the exact strata. This invention is of great value in determining the character of the Earth's crust. The coal found in No. 1 is not verified by the other wells; thus, its upper vein of 3 feet is not found in Nos. 2, 3 and 4—in No. 2 it runs out in black shale. The 5 foot vein in No. 1 becomes 10 inches in No. 2, about ½ a mile away, and is only 4 inches in No. 3, less than ¼ of a mile in another direction—while it becomes 2 feet or over in well No. 4; showing that the vein is less than a mile wide and runs north and south.

Prof. W. F. Stewart, of Virginia City, Nev., in an interesting lecture upon the subject of "Mineral Deposits," said that geologists and mineralogists disagreed as to the method of nature in the deposition of minerals, and unless the true method could be determined, the country's mineral wealth could not be developed properly. Men had argued that if the volcanic theory were true, gold, being the heaviest metal, would be found purer and in greater quantity at the lowest depths beneath the surface; but this had not proved to be the case. The Comstock Lode was first worked as a gold mine, and one-half of its bullion was still heavily alloyed with gold; at a depth of 400 or 500 feet it changed from a gold into a silver mine.

PLIOCENE MAN.

BY DR. CHARLES C. ABBOTT.

Without doubt, the memoir by Professor Whitney is the most valuable and interesting contribution yet made to the subject of prehistoric archæology. Not only has the topic great interest in itself, but this phase of it has an additional interest, because a portion of the evidence he brings forward has been subjected to much adverse criticism, not only by men of some scientific attainments, but by the popular secular, and the biased religious papers of the day. The author, however, effectually disposes of all objections, as we think, and clearly demonstrates the correctness of the conclusions he drew, years ago. While being occasionally hinted at in various ways, these conclusions have never been published *in extenso* until the appearance of the present volume.

We shall give in briefest outline the character of the evidence which Prof. Whitney here produces; it does not stand alone, but supplements and, we believe, confirms the indications of Tertiary man, both of Europe and Eastern North America. In his introduction the author remarks that "gradually the evidence has accumulated from widely separated regions, until the idea of prehistoric man has become familiar to geologists." He then asks, "How far back can man and his works be traced?" The memoir supplies an answer to this question so far as it relates to California. Any one who has spent days and weeks in searching for fossils or stone implements in gravel deposits, can testify how discouraging such work is. Millions of pebbles are to be glanced at and overturned, and often there is nothing but millions more to look at, when the surface of a bluff has been removed. In California, where the hydraulic method of attacking the gravel deposits is almost wholly employed, there is still less chance of finding objects of interest than there was in the older method of tunneling. Whether of bone or stone, traces of man subjected to violent displacement by streams of water are pretty sure to be destroyed or again buried by the rapid overturning of the gravel beds.

Much of the material on which Prof. Whitney bases his paper has been collected by Mr. C. D. Voy, and is now in the museum of the University of California. This material has been gathered principally from Mariposa, Merced, Stanislaus, Tuolumne, and Calaveras counties. In Mariposa county, stone implements and mastodon remains have been found intimately associated, at a depth of twelve feet. Much of like nature has been found in the two counties next referred to, while Tuolumne county is particularly mentioned as a region more prolific in human remains and prehistoric works of art than any other in California. This evidence of early man has been very carefully sifted by Prof. Whitney, and it appears that the fact of the remains being really found in such positions as to indicate great antiquity is fully demonstrated.

Calaveras county is more fully treated of, as the evidence is of somewhat different character, and has given rise to much discussion. "We now come,"

says Professor Whitney, "to a county where occurrences of human remains do not seem to have been as frequent as they were in the adjacent Tuolumne, but where one specimen has been obtained which has excited more interest than all the others put together, and which is popularly believed to be the only instance of the kind which has been met with in California. A perusal of the following pages will, however, it is thought, satisfy the reader that the belief of the existence of man in that region previous to the cessation of volcanic activity there, is not by any means supported by one item of evidence alone." The history of this "one item," the now celebrated Calaveras skull, is then given in minute detail. Suffice it here to state that it was found at a depth of 132 feet, and exhibits many peculiarities which tally with the statements of the finder, and are conditions which could only exist in a cranium found as this specimen is said to have been. This alone, as is most ably demonstrated by Prof. Whitney, should satisfy any one disposed to question the truthfulness of the statements made by the gentleman who found the specimen. Were nothing else ever to be found, there is in this Calaveras skull, as we believe, all that is necessary to demonstrate the existence of Pliocene man in California; but Amador, El Dorado, Placer, Nevada, and Butte counties have all yielded corroborative evidence. As Professor Whitney remarks, "the passage from Pliocene through Post-pliocene, if such a division can hereafter be maintained in this region, has been a gradual one, and some of the Pliocene animals have certainly lived close up to the Recent period. That a portion of the human remains and implements described in the preceding pages are as old at least as Pliocene, it seems hardly possible to doubt."

"The discoveries in California, India, and elsewhere seem clearly to indicate that the human race must have existed, over a large portion of the world at least, for an immense period of time in the primitive condition, that is, at the lowest possible stage of humanity — civilization it cannot be called. So far as California is concerned, the evidence all points in this direction. The implements, tools, and works of art obtained are throughout in harmony with each other, all being the simplest and least artistic of which it is possible to conceive. Whether found in the strata under the basaltic lava, or above, at any point in the detritus, we always recognize the same type."

The conclusions of Prof. Whitney's volume are as follows:

"*Finally*, as the summing up of the discoveries and investigations made by the Geological Survey in California, we have:—

"1. The clear and unequivocal proof, beyond any possibility of doubt or cavil, of the contemporary existence of man with the mastodon, fossil elephant, and other extinct species, at a very remote epoch as compared with anything recorded in history.

"2. That man, thus proved to be contemporary with a group of animals now extinct, did not essentially differ from what he now is in the same region, and over the whole North American Continent.

"3. That there is a large body of evidence, the strength of which it is

impossible to deny, which seems to prove that man existed in California previous to the cessation of volcanic activity in the Sierra Nevada, to the epoch of the greatest extension of the glaciers in that region, and to the erosion of the present river canyons and valleys, at a time when the animal and vegetable creations differed entirely from what they now are, and when the topographical features of the State were extremely unlike those exhibited by the present surface.

"4. That man existing at even that very remote epoch, which goes back at least to the Pliocene, was still the same as we now find him to be in that region, and the same that he was in the intermediate period after the cessation of volcanic activity, and while erosion of the present river canyons was going on.

"5. That the discoveries in California, and those in other parts of the world, notably in Portugal and India, present a strong body of evidence going to prove the existence, during an immensely long period, of the human race in its primitive condition—that is to say, in the simplest and rudest condition in which man could exist and be man.

"6. That so far as we know, there is no evidence of the existence of any primordial stock from man may have been derived, so far back at least, as the Pliocene. Man, thus far, is nothing but man, whether found in Pliocene, Postpliocene, or Recent formations."

That some of these conclusions, here so positively stated, may be modified by future discoveries, is highly probable. Especially as to the discovery of some "primordial stock," do we think this to be the case. That such stock once existed is necessarily true; that all trace of it has vanished is improbable; and not earlier than the dawn of the Pliocene is it necessarily needful that one should go to seek for such traces. The Pliocene epoch was not a matter of a few years, and what the formations of that age, in other continents, may contain that shall throw light on man's origin, have yet to be gathered. When the Pliocene strata of Africa and Asia have been carefully examined, and they are found to contain no traces of man more primitive than those of California and elsewhere, then it will be proper to expect that such traces will be found in the Miocene. That unquestionable traces of the missing link are now resting in some tertiary deposits, we have not the shadow of a doubt.—*Science News.*

THE WONDERS OF GEOGRAPHICAL EVOLUTION.

It is to the mountains that we must betake ourselves to learn the plan of the terrestrial architecture. On the great low-lands of the world the superstructure is concealed by a deep accumulation of superficial detritus, but among the mountains the whole construction of the earth's rocky coast is laid bare. There, amid all that is grand and most impressive in nature, the chronicles of the globe must be read. The lecturer referred to the poetry inspired by mountain scenery in all times, and the desire of men to explore the secrets of the hills. He then considered the apparent complexity of mountain structure, and showed wherein the

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stratified rocks were a clue in unraveling the complexity. From a study of mountain architecture, he continued, we learn that the dry land has been upheaved at many successive periods, from the sea floor; that these upheavals have taken place generally along the same persistent lines, and that they were separated by prolonged periods of subsidence. After each uplift the new land has been exposed to disintegration, and its debris has been carried out to the sea bottom, there to accumulate into the thick masses of rock out of which future lands were to be formed. During the more important movements of upheavals, massive sheets of solid rock have been compressed, crumpled, and even rendered crystalline, and have been squeezed up along lines which have formed mountain chains. Volcanoes, too, have broken out along these lines of terrestrial disturbance, and have poured forth enormous volumes of lava from their heated interior. By revolutions of this nature, often repeated, the framework of the land has been slowly built up. During the early ages of tardy mountain growth, many tribes of plants and animals have come and gone. These reveal the fact that there has been a history and progress of organic life as well as the solid platform on which this life has been manifested. Generation after generation has passed away; species have changed, even whole types of existence have entirely disappeared, but the reports of this progress in the organic world have been preserved within the rocky frame-work of the land in sufficient fullness to serve as landmarks in geological history. The remains of the extinct ferns and trees, corals and shells, fish and reptiles, entombed within the mountains, becomes the clue by which the successive dates of the upheaval of these mountains are relatively fixed. They bring before us glimpses of the geography of the long vanished past—here a fair woodland with its lakes and streams; there a sandy shore bounded by bird and reptile; while often amid the rugged landscapes of the heart of a continent they tell us that there of old lay "the stillness of the central sea."—*Prof. Geike.*

MEDICINE AND HYGIENE.

DIGESTION AND DYSPEPSIA.

A remarkable discussion, which has been going on for some time at the medical societies in Paris, has terminated in an important lecture by M. Charles Richet, upon the subject of digestion and the hygiene of the digestive organs. He has, in this instance, brought forward some very useful considerations, which cannot fail to interest our readers, since perfect health and the proper treatment of disease depend so entirely upon our knowledge of the functions here discussed.

The first question is: What is the influence of the various alimentary substances upon the secretion of the gastric juice? This product of our organism

contains two different chemical principles, hydrochloric acid and pepsin, and it is necessary to consider the influence of food upon each of these substances, that is, on the secretion of the acid, and on the secretion of pepsin.

As regards the secretion of acid, there is a fact which predominates the whole physiology of the stomach. This fact may be condensed into a few words, and we have proclaimed it when we assert that the gastric juice always tends to preserve a certain state of acidity. In the case of man, this acidity is represented by 0.2 per cent. of hydrochloric acid, but varies, according to circumstances, from 0.1 to 0.3 per cent. of HCL. When alkaline substances are taken, there occurs an increased secretion of the acid; it becomes so abundant in this case that, in the course of a few hours, not only have the alkaline substances been entirely neutralized, but the gastric juice has recovered its normal degree of acidity.

On the other hand, if acids are taken, a most curious thing occurs. In this case the gastric secretion is dried up, or slackened for awhile, until, the acids being got rid of, the stomach recovers its normal or primitive acidity. This appears to occur by exosmosis of the ingested acid, whilst the acid secretion remains suspended. Now M. Charles Richet tells us that the consequence of this fact is that acid food, such as children and young girls (especially those who are subject to hysteria) are so fond of, is bad food for the stomach. They impede the gastric secretion, and the normal hydrochloric acid of the stomach is replaced, for the time, by acids much less favorable to digestion, such as tartaric, oxalic, citric, acetic acids, and others, whose action upon albuminous substances is very different from that of hydrochloric acid.

The same remarkable phenomenon occurs when salts of these organic organs form a large portion of the ingesta, such as tartrates, citrates, etc. These salts are all decomposed by the normal acid of the gastric juice, their acids are displaced by the hydrochloric acid, and so become free. Thus the stomach receives again free tartaric or free citric acid, etc., and we have a repetition of the circumstances alluded to above. Therefore, we must, according to Richet, look upon all acid liquids, such as vinegar, sour fruits, lemon juice, etc., as being unfavorable to gastric digestion, when inquired into from a hygiene point of view.

Another very interesting fact relates to fermentation of the food in the stomach. When alimentary substances are withdrawn in a half chymified state from this organ, and their degree of acidity determined, it is found that this acidity has increased, that it is evidently higher than the normal degree, that a certain amount of fermentation has taken place, both in normal health and in pathological cases. This fermentation, the author asserts, is due, at least partially, to those lower organisms termed "ferments," or "organized ferments," which are contained, more or less, in all kinds of food. It is often very useful to digestion, but sometimes not so, and then it gives rise to acid dyspepsia, with flatulency, which is characterized by acid eructations. Most frequently it is found to be lactic fermentation, but sometimes butyric fermentation occurs, which evolves hydrogen and carbonic acid.

Now, according to the same authority, there are two methods, in appearance contradictory, for causing such exaggerated fermentation to cease, and so to get rid of the dyspeptic symptoms. Both methods, though so opposite in nature, lead to the same result. If lime, or alkaline carbonates, or magnesia, is prescribed, these basic substances saturate the abnormal acid, and when no more excess of acid is present, the mucous membrane of the stomach will be enabled to secrete gastric juice with its normal acid as before. But if instead of administering alkaline or basic substances, mineral acids are prescribed, such as hydrochloric or sulphuric acid, the result will be the same. M. Richet has, at least, convinced himself by experiment that those fermentations caused by microscopic organized ferments are impeded by the presence of a mineral acid. There may be a considerable amount of truth in this from a theoretical point of view, but, practically, colic is produced by the slightest quantity of mineral acid in the stomach, pointing to the fact that nature never intended it to be there, except in the shape of gastric juice, the chemical properties of which are still in great measure hidden from us.

If M. Charles Richet has found that a minute dose of hydrochloric acid, or of sulphuric acid, will overcome what he calls acid dyspepsia, the result of fermentation, he will have caused medical science to have taken a decisive step in a very troublesome and much frequented thoroughfare.

Meanwhile, let us see what he has to tell us on the second question — the influence of the various alimentary substances upon the secretion of pepsin. Since the experiments of Beaumont, Claude Bernard, and Schiff have thrown so much light on this subject, it is well known that all excitations of the stomach do not produce a gastric juice equally favorable to the digestion of albuminous matter. Cellulose, unripe fruit, salad, and spinach, for instance, were found to be very indigestible. They cause an abundant watery flux, in which there is very little pepsin. On the contrary, when milk, meat, or eggs are taken, there is a great secretion of pepsin.

But there exists one important cause of pepsin secretion which might be overlooked by a superficial observer, but should always be present in the mind of the medical man, and this is *appetite*, which must be considered in connection with its opposite, or *disgust* for the particular kind of food offered. At the moment that food is presented to a dog there is an abundant flow of saliva; at the same instant the mucous membrane of the stomach reddens, and a secretion of pepsin occurs. Precisely the same thing occurs in man also, and those who are acquainted with the predominating influence of the nerves upon secretion in general, and have present in their minds the intimate dependence of the gastric membrane upon the central nervous system by the intermediary of the pneumogastric nerve and the medulla oblongata, will not be surprised at it. In the same manner vomiting, nausea, and disgust for food are accompanied by a contraction of the vessels of the face, and contraction of the muscles of the stomach. The mucous membrane of this organ then turns pale like the face of the individual, and in these conditions the secretion of gastric juices ceases.

No intelligent medical man would prescribe any particular kind of food for a patient unless he had carefully informed himself whether this patient possessed an antipathy for such food.

The last point which we shall examine in M. Charles Richet's lecture concerns the influence of the gastric juice upon the various kinds of food; in other words, the digestibility of the various alimentary substances in daily use. Milk is the most easily digested of all these. After ingestion of a pint of milk scarcely a trace is to be found in the course of an hour. It appears probable that milk contains some principle not yet isolated by chemists, the action of which is very similar to that of pepsin, and adds its influence to the latter in the phenomenon of digestion. At the same time M. Richet admits that milk supplies, during this function, a certain amount of lactic acid which co-operates with the acid of the gastric juice. The milk of the cow is, during the function of digestion, precipitated in coarse clots of caseine, whilst that of woman, and mares', and asses' milk are precipitated in much finer granulations, that are considerably easier to digest Hence the inapplicability of cow's milk to the nutrition of very young children; hence, also, the advantage of mares' milk, or asses' milk for cases of dyspepsia in subjects of delicate constitutions. For the young child, the mother's milk can be replaced by nothing; in this all our greatest authorities agree with Dr. Richet. On the other hand, experience has taught us that whatever disease a patient may be suffering from, even in cases of cancer, ulceration, and dyspepsia, a milk diet possesses the greatest advantages.

Without following our author further on the subject of food itself — better known, perhaps, in England than in France — we will conclude by referring to his hygienic precepts as regards digestion and dyspepsia. These are—to live upon a mixed diet, with little wine, and few aliments of an acid or woody (cellulosic) nature. To take moderate repasts. Mankind suffers more from over-feeding than from the contrary. It is a great mistake to imagine that the more food one takes the more mental or bodily work can be done. Over-feeding is the great curse of the age, and equals that of over-drinking by the numerous diseases to which it gives rise. To take our meals with regularity, always at the same hour, and to take care that whilst digestion is proceeding after a meal no food, to interfere with it or check it, is introduced into the stomach. In brief, one digestion should be allowed to terminate before another is begun.

With regard to the hygiene of dyspeptics, the medical man alone can advise according to the constitution and tastes of his patient; but a milk diet is, in most cases, fraught with the greatest advantages, and is no doubt in strict accordance with physiological laws.

DWELLING-HOUSES; THEIR SANITARY CONSTRUCTION AND ARRANGEMENTS.

BY PROF. W. H. CORFIELD, M.A., M.D. (Oxon).

Ventilation, Lighting, and Warming.

The air in our houses is rendered impure in various ways, but chiefly by our respiration, and by the products of combustion that are allowed to escape into it from lights and fires. The air that we expire contains a certain quantity of foul, or putrescent, organic matter. It is charged with moisture, and contains about five per cent. less oxygen, and nearly five per cent. more carbonic acid than the air that we inspire. It is neither the diminution of oxygen nor the increase of carbonic acid in the air of rooms that is of the greatest importance to living beings, but the accumulation of foul organic matter, and the excess of moisture. It is this which renders such atmospheres stuffy, and not the diminution of oxygen or the increase of carbonic acid, which are so slight as to be of little importance, even in overcrowded rooms. Nevertheless, since the increase in carbonic acid is proportional to the increase in other impurities, and since we can estimate very accurately the amount of carbonic acid in the air, the increase of carbonic acid is taken as an index of the impurity of the atmosphere. The average amount of carbonic acid in the outer air is four parts in ten thousand. Professor De Chamont found by his experiments that, whenever the amount of carbonic acid in the air of a room exceeded the amount in the outer air by more than two parts per 10,000, the air of the room was not fresh, that is, say, that the foul organic matter in it and the excess of moisture were sufficient to make the room stuffy. Hence, two parts of carbonic acid per 10,000 of air, over and above that in the outer air, are taken as the limit of respiratory impurity. As an adult breathes out, on the average, six cubic feet of carbonic acid in ten hours, it is clear that, in order that the air of the room in which he is may be kept fresh, he must have 30,000 cubic of air in the ten hours, or 3,000 per hour. In this climate we cannot change the air of a room more than three or four times per hour without causing draught, and so each person ought to have from 1,000 or 750 cubic feet of space, the air of which should be changed three or four times per hour respectively. The way in which this space is arranged is also a matter of some importance. For instance, the air above a certain height is of little use for purposes of ventilation if combined with too small a floor space. To take an extreme case — a man standing on a square foot of ground, with walls 3,000 feet high all round him, would be in 3,000 cubic feet of space; but it is quite obvious that he could not live in it. But, even without any inclosure at all, and without any limit as to height, it is not difficult to conceive a place overcrowded. For instance, all the inhabitants in the world, men, women, and children, could stand upon the Isle of Wight; but it is quite certain that they could not live there, even

if it were only for the want of air. So it is usual, in estimating cubic space, to disregard the height above eleven or twelve feet. It is also obviously of importance that the floor space should be properly distributed; but about this, so far as dwelling-houses are concerned, there is no need to enter into particulars. We are not able to insist on anything like 1,000 or 750 cubic feet of space in all instances, and amounts varying down to as low as 300 cubic feet per individual are adopted. In the case of a family living in one room, which is so small as to afford less than 300 cubic feet per individual, it is usual to consider that the limit of overcrowding which should be allowed by law has been reached. We cannot have, as a general rule, rooms so large that the air does not require changing while we are in them. Thus, for instance a person in a bedroom for seven hours consecutively requires about 21,000 cubic feet of air if the atmosphere is to be kept fresh. Supposing him to have this without change of air, he would require a room, say, 70 feet long by 30 wide and 10 high. This makes it quite clear that in rooms such as we have there must be a change of air.

In studying ventilation from a practical point of view, the chief agents that we have to consider are the winds and movements produced in the air by variations in its density, usually brought about by variations in its temperature; the property of the diffusion of gases by means of which the air is brought to a uniform composition when the temperature is the same throughout, being one which, practically speaking, does not affect the question much. With artificial methods of ventilation, in which the air is forced in a certain direction by machinery, we have little to do, as few of them are suitable for use in dwelling-houses. The wind, as an agent of ventilation, is powerful, but its disadvantage is that its action is irregular. When all windows and doors can be opened, a current of air which may be imperceptible is quite sufficient to change the air of a house in a very short time, and houses that have windows on both sides are for this reason more healthy than houses built back to back, which can never have thorough ventilation. This is the direct action of the wind, which may generally be utilized in large rooms with windows on opposite sides, like school-rooms, by opening that which is nearest to the direction from which the wind comes a little way at the top, and also opening the one which is diagonally opposite to it at the top a little further than the first one. The direct action of the wind has also been utilized for ventilating large houses by Silvester's plan, which consists in having a large cowl, that always faces the wind, at the top of a pipe leading down into cellars in the basement of the house, where the air can be warmed by stoves, and allowed to ascend into the house. By this plan the holds of ships are frequently ventilated. But the aspirating action of the wind is, perhaps, of greater importance. When the wind blows over the top of a chimney, or over a ventilating pipe, it causes a diminution of pressure of the column of air in the chimney or ventilator, and so produces an up-current upon precisely the same principle that little bottles made for distributing scent about apartments act. For this reason, it is, as was hinted in the last lecture, important that chimneys should be higher than the

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surrounding buildings, so that any wind that blows may cause or increase an up-draught in them. In this way not only is smoke prevented from ascending into the rooms, but the amount of air carried through rooms up the chimneys is increased, and the ventilation of the house improved. There being, then, in ever house, and frequently in every room, a shaft—whether sufficient or not, we will consider by-and-by—for the escape of air, it becomes of the first importance for us to consider the means by which air may be admitted into our houses, and into our rooms. In summer, and whenever the air is as warm outside the house as inside of it, there is no difficulty about this. We have only to open the windows—wind doors, remembering the proverb that "Windows were made to open and doors to shut"—on both sides of the house, and the air is generally changed fast enough, but it is in winter, when the air is colder outside than inside, that the difficulties arise, and so in speaking of ventilation I shall always assume that the air outside the house is colder, and therefore heavier, and exercises greater pressure than the air inside it. This being the case, it follows that if we open a window, or make an aperture through a wall into the outer air, or through the wall of a room into a passage or staircase, in which the air is colder than it is in the room, air will come in. In fact, a room under these conditions may be looked upon as if it had water outside of it, and it is quite apparent that, in such a case, if you bored a hole through the wall in the water on the other side, water would come in, and the air of the room would escape by the chimney. This is precisely what happens with the cold air outside. If no special opening is provided through which the cold air can come into a room, it enters through such openings as there are; by the apertures between the sashes of the windows, by the—perhaps fortunately—badly-fitting doors, crevices in the floors, walls, and cupboards, through the walls themselves, as has been shown by Pettenkofer, and sometimes down the chimney. If, then, air will come in through an aperture placed in any position, it becomes necessary to consider where apertures should be placed and what precautions are necessary with regard to them. Theoretically, the admission of pure air should be at the lowest part of the room, and the extraction of the vitiated air, which is warm, at the upper part of the room; but practically the outer air cannot be admitted without certain precautions at the lower part of the room by mere apertures, as everybody knows who has been accustomed to sit in a room when a draught comes under the door. On the other hand, if an aperture is made into the outer air through a wall at a few feet from the door, the air enters in a cold straight current for some distance into the room. If the aperture be higher up, it comes in and falls, just as water would do, on to people's heads, somewhere about the middle of the room. So it is quite clear that certain precautions are necessary in the admission of air so as to prevent draughts. Since we have, or ought to have, windows in all rooms, it will be convenient to consider, first, the ways in which they may be utilized for the admission of air. We cannot simply open a sash window at the top or bottom in cold weather without feeling a draught, but there are several ways in which this diffi-

culty may be got over. The simplest is by placing a board of wood underneath the lower sash, as suggested by Dr. Hinkes Bird, whose original model I have here. This board is sometimes now made with a hinge in the middle, so that it can be got in and out more easily; or the board, instead of being placed under the lower sash, may be placed across, from side to side, in front of the lower part of the lower sash, so that the lower sash may be opened to a certain height without any air coming in below it. These boards may be covered with green baize, or some other suitable material, so as more perfectly to prevent the entrance of the air at the lower part of the window. In either case, the bars of the sashes at the middle of the window are no longer in contact, and air comes in at the middle of the window, between the two sashes, taking an upward direction, in the form of a fountain, and producing no draught. This shows us the direction in which cold air ought to be admitted into a room—after the fashion of a fountain, in which it can be readily obtained, owing to its greater pressure, and not after the fashion of a waterfall. This simple plan, which I recommend very strongly for adoption, has two disadvantages, one that nervous people always fancy there is a draught if they see anything like a window open, and the other a much more practical one, but one that is common to most forms of ventilation that are inexpensive—that a certain quantity of soot enters. These conditions are, to a certain extent, got over by the plan suggested by several inventors—of boring holes through, or cutting pieces out of the lower bar of the upper sash. Such holes are not seen, and the air comes through them in a vertical direction into the room.

They can also be fitted with little boxes containing cotton-wool, through which the air will be filtered and deprived of soot, etc This, of course, very considerably diminishes the amount of air that enters, and the cutting also weakens the framework of the window. I may here mention Currall's window ventilator, which consists of a metal plate fastened along the lower bar of the lower sash, and parallel to it, with an opening below the sash for the admission of air, which is thus deflected into a vertical direction by the metal bar. Here will be also a convenient place to mention the automatic sash fastener patented by Messrs. Tonks and Sons, by means of which the window is securely fastened when opened to the extent of three or four inches, either at the top or bottom, so that the window can be left open without anyone outside being able to open it further. This can also, obviously, be combined with the window block placed underneath the lower sash, so that air can be admitted in the proper direction, and the window still be securely fastened. Louvred ventilators may also be used in a variety of ways in connection with windows. Where there are Venetian blinds, it is only necessary to open the top sash, pull the Venetian blinds down in front of the opening, and place the louvres so that they give the entering air an upward direction. Glass louvres fixed in a metal framework may also be used, a pane of window being taken out and one of these ventilators substituted for it. The louvres can be opened and shut by means of a string, and they are so fixed that it is impossible to break them by doing so. They are generally fixed instead of one

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of the top panes of the upper sash. It is better to place them lower down in the upper sash, and this is true of all inlets of air. If they are too high up, the air, being admitted in an upward direction, impinges against the ceiling, rebounds into the room, and produces a draught. The metal framework of these ventilators requires oiling and attending to or it will get rusty. In some places fixed louvres of wood, or still better, of strong glass, may be fixed with advantage, or swinging windows with sashes hung on centers may be used, as, for example, in water-closets; and these, where it is advisable, may be prevented from being closed by means of a small wedge of wood screwed to the framework. The blind so often placed across the lower part of a window may also advantageously be used as a ventilator, or, where no blind is required, a glass one may be used, this being made to swing forward on its lower edge, so as to give the entering air an upward direction when the lower sash is opened, as in the model here shown, which was presented by Messrs. Howard to the Parkes Museum. Where very large quantities of air require to be admitted, one or more sashes of a window may be made to swing forward in this way, as is now done in the large hall of Willis's Rooms. Near to all windows, in the cold weather, the air of the room is colder than at other parts of the room. This may be obviated, when considered advisable, by the employment of double windows, the layer of air between the two windows preventing, to a very considerable extent, the cooling of the air inside the room. It is not advisable to have double panes of glass in the same sash, as the moisture between them will render them more or less opaque in certain states of the weather. With double windows, air may be admitted by opening the outer one at the bottom and the inner one at the top.

Where French casement windows are used, as they sometimes are unadvisedly in this climate, ventilation may be provided by having a louvred opening above the casements of the window, or by making a glass pane or panes capable of being swung forward on the lower edge. Lastly, Cooper's ventilator is largely used for windows, and also in the glass panes over street doors. It consists of a circular disc of glass, with five holes in it, placed in front of a pane of glass with five similar holes, and working on an ivory pivot at its center. It can be moved so that the holes in it are opposite to those in the window-pane, when air will, of course, come in; or so that they are opposite to the places between the holes in the panes, when the air will be prevented from entering. It is obvious that the air is not admitted in an upward direction, but the disadvantage of this is partly counterbalanced by the fact that it is admitted in five small streams, and not in one large one, so that there is less probability of a draught. The air may also be admitted through apertures made in the walls or doors. The simplest way to do this is to make a hole through the wall, and fasten a piece of board in front of it in a sloping manner, so as to give the air an upward direction. It is better to put "cheeks," as they are called, on the sides, for they serve not only to attach the sloping board to the wall, but to prevent the air from falling out sideways into the room. This ventilator may be hidden by hanging a picture in front of it,

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and will cause no draught. I may state here that it is better, in a large room, to have two or more small ventilators, of any kind whatever, than one large one, and that no single inlet opening should be larger than a square foot. Openings of half that size are preferable. It is calculated that there should be 24 square inches of opening per head, so that a square foot would be sufficient for six persons. In such an opening as has been described, wooden or glass louvres may be placed.

The same end may be attained by making one of the upper panels of a door to open forward with hinges to a certain distance, or even, in some instances, by fixing it in this position. An obvious disadvantage, and one which always has to be considered in making openings through walls and doors, is that conversation which goes on in the room can be heard in the passage outside. Sherringham's valve is a modification of this plan, and can be fitted either into an outer wall or into one between the room and the passage or hall. It consists, as you see, of a metal box to fit into the hole in the wall, with a heavy metal flap, which can swing forward, and is exactly balanced by a weight at the end of a string passing over a pulley, the weight acting as a handle, by means of which the ventilator can be opened or shut, or kept at any desired position. What has been said before applies to these ventilators; they should not be placed too near the ceiling, and this is the mistake that is generally made in fixing them. Stevens's drawer ventilator may also be mentioned here. The name almost describes it. It resembles a drawer, which is pulled out of the wall for a certain distance, and allows air to come into the room vertically, in several streams, between metal plates placed inside the drawer. Jennings's "Inlet," which is in use in the barracks, consists of an opening through an outer wall into a chamber in which dust, etc, is deposited, and thence between louvres into the room. Here I may mention that it is sometimes advised to place perforated zinc or wire gauze outside the entrance to the ventilators, so as to prevent dust, etc., coming into the room. This is not advisable, as the apertures get clogged up, and the entrance of air is much impeded. It is better to have an iron grating, which will prevent birds entering, and to employ other methods for preventing the entrance of dust, soot, etc. Where this is considered necessary, the plan of passing air through cotton-wool, which must be frequently changed, may be adopted.

Currall's ventilator for admitting air through the door is sometimes useful. It resembles his window ventilator almost exactly; a long slit is cut through the door, a perforated metal plate placed outside, and a flat plate fixed parallel to the door inside and in front of the slit, thus giving the air as it comes into the room an upward direction. An admirable plan for the admission of air into rooms is by means of vertical tubes—an old system, but one which has been brought into prominence of late years by Mr. Tobin. A horizontal aperture is made in the wall into the outer air just above the floor, and then a vertical pipe carried against the wall the height of from four to five feet. The cold air is thus made to ascend like a fountain into the room. It does so in a compact column, which only perceptibly spreads after it has got some height above the mouth of

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the tube. It then mixes with warm air at the top of the room, producing no draught at all. In spite of the vertical height through which air has to pass before it emerges into the room, a cons derable amount of soot and dust of various kinds is brought into the room. This may be obviated by placing a little cotton-wool in the interior of the tube. This, however, although a very efficient plan, has the serious disadvantage of impeding the current of air. A better plan is the one patented by the Sanitary Engineering and Ventilating Company; a tray containing water is placed in the horizontal aperture in the wall, the entering air being deflected on to the water by metal plates. The greater part of the dust is thus arrested by the water, which is changed as often as necessary. In warm weather ice may be placed in the trays. Another plan is to place in the vertical tube a long muslin bag with the pointed end upward, and kept in shape by wire rings. This provides a large filtering area, and offers very large resistance to the passage of air. This may be taken out and cleansed as often as necessary. Several contrivances have been devised for the admission of air close to the floor, just behind a perforated skirting board. Among these are Ellison's conical ventilator, shown in the last lecture, and Stevens's skirting board ventilator, in which metal caps are placed in front of the inlet openings, and so distribute the air that no draught is felt. I think, however, that it is only advisable to admit warmed air at a low level into rooms, but there is no reason why such openings should not be made high up in the rooms—behind cornices, for example. Pritchett's paving, made of agricultural pipes, may also be used for making walls and partitions, and is obviously applicable for ventilation purposes, whether used as inlet or outlet.

We now come to speak of exit shafts and valves. The first and most important of these is the chimney, about which I have already spoken. I need only add here that it is advisable to do without the use of cowls on chimneys wherever it is possible. If the chimney can be made high enough it will not require a cowl, and if it cannot, a simple conical cap is generally sufficient to prevent down draughts. There is no doubt, however, that Boyle's fixed chimney cowl for preventing down draught not only does so, but produces an up draught in the chimney when the wind blows down upon it, as I can readily show you with the model I have here. A small piece of wool is made to ascend in a glass tube by blowing vertically down upon the fixed cowl placed upon the top of it. Of revolving cowls for chimneys, the common lobster-backed cowl is probably the best. Whilst speaking of cowls, I may as well mention that a variety of cowls, some of which I have here, have been invented with the object of increasing the up draught in exit shafts of various kinds; some are fixed, as Boyle's, Buchan's and Lloyd's, and some revolving, as Scott, Adie, & Co.'s, Howarth's, Stidder's, Banner's, Stevens's, and the one invented by Mr. Boyle, but discarded by him some years ago. Whether any of these increase the up current in exit shafts is a matter which is still under investigation, but I can show you, quite easily, that the common rough experiment, by means of which they are supposed to do so,

is entirely fallacious. Cotton wool is drawn up a tube at least as easily by blowing across it in a slanting direction as by blowing through a cowl placed on the top of it The fixed cowls have the advantage that they cannot get out of order. The revolving cowls have the disadvantage which is common to all apparatus with moving parts, that they are certain to get out of order some day or other. Whether they increase up draughts or not, there is no doubt that most of them prevent down draughts, and, like any other cover, prevent the entrance of rain. Openings are sometimes made high up in the chimney flue and protected by valves, the best known of which is Arnott's valve, which consists of a light metal flap, swinging inside a metal framework in such a way that it can open toward the chimney flue. but not toward the room. Any pressure of air from the room toward the flue will, therefore, open it and allow the air to escape from the room into the flue. Pressure of air the other way will shut it. The disadvantages of this ventilator are that it makes an irregular noise, although this has been, to a considerable extent, obviated by the india-rubber padding with which it is now fitted. It also occasionally admits a little soot, and, of course, air at the same time, from the flue into the room. Boyle's chimney ventilator, made by Messrs. Comyn, Ching & Co., is a modification of this. Instead of the light metal flaps there are a number of small tail flaps. These make little or no noise, but they are liable to be opened by a current of air in the chimney. It is obviously, it seems to me, at variance with sound sanitary principles to make openings from the interior of the room into the chimney flues, and then to trust to valves to prevent the air of the flue from coming in. A far better plan is to have shafts placed by the side of the flues, and this, of course, is better done when the houses are built. The easiest and most satisfactory way of doing it is by means of air flues and smoke flues combined, in which the air flues are moulded in the same piece of fireclay as the smoke flue itself. These air flues can be connected with the upper parts of the rooms, and up draughts will be inevitably caused, as the air in them will be considerably heated on account of its immediate contact with the outer side of the flue. Such shafts can only serve as inlets when the flues are cold, and so it is advisable to use them especially with flues that are always hot—as, for instance, that of the kitchen chimney—and it is desirable, wherever it can be done, to connect the kitchen with a different air-shaft from the other rooms, or it is possible the air from the kitchen may get into some of the other rooms of the house. Of exit ventilators not connected with the chimney flues, I may mention Mackinnell's, which also provides an inlet for air as well, and which is very useful in small rooms, closets, etc., having no rooms over them. It consists of two tubes, one inside the other, passing through the ceiling into the outer air. The inner one is larger than the outer one, and projects above it outside and below it an inch or so into the room. At its lower end a circular rim is attached horizontally parallel to the ceiling. The outer air enters between these two tubes, and is deflected by the rim just mentioned along the ceiling, so that it does not fall straight into the room. The vitiated hot air passes

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out by the inner tube, the action of which is, of course, considerably increased if a gas burner or other light be placed beneath it. It is upon this principle that the lamps for lighting railway carriages are made, the reflector answering the purpose of the rim round the end of the inner tube, and the air to supply the lamp coming in between the reflector and the glass shade, while the products of combustion escape through the pipe leading from the middle of the reflector, and immediately over the flame Of course Mackinnell's ventilator requires a cover to keep out the rain, and it is necessary, in fact, to have a double cover, so that the heated air which escapes by the inner tube shall not be carried back into the room by the entering air. Tossel's ventilator is a variety of this, with a cover by means of which the action of the wind is able to be taken advantage of. The same inventor has also contrived one which can be used between the ceiling of one room and the floor of the room above, provided that this space can be well ventilated.

This brings us naturally to say a little about lighting. Candles, lamps and gas make the air impure. It is calculated that two sperm candles, or one good oil lamp, render the air about as impure as one man does, whereas one gas burner will consume as much oxygen and give out as much carbonic acid as five or six men, or even more. This is why it is commonly considered that gas is more injurious than lamps or candles, and so it is when the quantities of light are not compared, but with the same quantity of light, gas renders the air of a room less impure than either lamps or candles. If, in the dining room, instead of using five or six gas burners, as we too often do without any provision for the escape of the products of combustion, we used 40 or 50 sperm candles instead of 6 or 8, we should have a fairer comparison between gas and candles. I have no time to enter into a discussion of the relative merits of various kinds of candles and lamps, but with regard to gas I would say that, considering the fact I have just stated, it is always advisable to provide a means of escape for the products of combustion immediately over the gas burners. By this not only may these products be carried away, but with a little contrivance, heated air may be drawn out of the room at the same time, and so an efficient shaft provided, in addition to the one found already in the chimney. Very simple contrivances will answer this purpose. A pipe, with a funnel-shaped end, starting from over the gas burner, and carried straight out into the open air, with a proper inlet opening, is all that is required in some instances, as in badly placed closets. For large rooms, the sunlight ventilators are found to answer admirably. They should be provided with a glass shade, placed below them to intercept the glare, and to cut off a large portion of the heat. An elegant contrivance for dwelling rooms is Benham's ventilating globe light. In this, the products of combustion of the gas pass along a pipe placed between the ceiling and the floor of the room above, into one of the flues This pipe, being surrounded by another opening into the ceiling of the room at one end, and into the flue at the other, is guarded at its entrance to the flue by a valve which can be easily shut when the gas is not

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burning. This double tube, as it passes under the floor of the room above, is covered with fire-proof material, so that the floor is not affected by it. The joists, where they are notched, have iron bearers put across to support the floor-boards above. Air is admitted by another pipe passing through the wall of the house into the external air, and ending also in the ceiling of the room by openings around those of the exit shaft. Thus warm air is introduced into the room at the same time that vitiated air from the upper part of the room, and also the products of combustion of the gas, are carried out of it into the chimney flue.

I may say a few words about some grates and stoves that have been devised with the view of combining ventilation and heating. The first of these is Captain Douglas Galton's grate, in which there is an air chamber placed around the flue, and communicating on one side with the external air, and on the other with the atmosphere of the room by various apertures. The outer air which passes into this chamber is warmed by contact with the heated flue, and issues into the room, thus supplying the room with warmed air, and utilizing a considerable quantity of the heat that would otherwise be lost. There are several other grates, such as the Manchester school grate, made upon this principle, with variations in the arrangement of the inlet apertures, which are placed vertically like Tobin's tubes, etc. It is important in all these contrivances, where outer air passes through a chamber in which the back of the grate and flue is placed, that the back of the grate and the commencement of the flue in that chamber should be cast in one piece of metal, so as to have no joint. If there are joints they will become after a time defective, and the air from the flue is liable to escape into the chamber around it and be brought back into the room by the entering air. Some slow combustion stoves, as George's "calorigen," have air pipes passing through them, and have the external air warmed on its way through the stove into the room. Iron slow combustion stoves dry the air too much, and unless they are lined with fire-clay, are apt to become too hot and to cause an unpleasant smell in the room by the charring of the organic matter in the air. They are much more suitable for warming large buildings, where economy of fuel is an important object, than they are for use in sitting rooms or offices. It is usual to place a vessel of water on the top of these, with the view of obviating, as far as possible, the dryness of the air that they produce. It must be borne in mind that closed slow combustion stoves do not act as ventilators, as the air to supply the fuel—usually coke—is brought by a pipe from outside, and this is another reason why they are not so advantageous as an open fire or a quick combustion stove in dwelling-rooms. In the Thermhydric grate of Mr. Saxon Snell a small boiler is placed behind the grate, and communicates with a series of iron pipes alongside of it. These are filled with water, which is, of course, kept warm, and air is admitted to the room between these hot-water pipes. Thus, it is neither dried nor heated too much. The products of combustion are carried away by a flue, which may be placed under the floor; so that the grate, if required, may stand in the middle or in any other part of the room. Gas stoves are gradually

becoming largely used instead of coal, and, when proper provision is made for the escape of the products of combustion, they are certainly very convenient and cleanly contrivances. I have no doubt that this will, in the end, be found to be the proper use for gas, and that we shall cease entirely, or almost entirely, to use coal in our houses. By using coal in the way that we do, we lose all the valuable by-products—the ammonia, the tar, the carbolic acid, aniline dyes, etc., which are derived from the refuse of gas works, and which are worse than useless to us in our fires. Gas may be burned either mixed with air or not. In the first instance, a gas stove or grate filled with pumice stone or asbestus does not much resemble an ordinary fire, but if the gas be burned unmixed with air it is almost impossible to tell the difference. Generally speaking, it is found necessary when there are several gas stoves in a house, to have a special supply of gas with larger pipes for them. What the gas companies should do is to lend gas stoves of various kinds, especially cooking stoves, to their customers for a small annual payment, as is done very successfully in continental cities. It is important that gas cooking stoves should not give an unpleasant smell of unburnt gas as some do. This is not only a waste but a nuisance, as coal gas always contains carbonic oxide (an extremely poisonous substance), and should, therefore, not be allowed to escape into the air, even in the smallest quantity.

I have now to mention an artificial system of ventilation which has been lately introduced by Messrs. Verity Brothers. It consists of a fly-wheel fitted with fans or veins. The wheel is made to revolve by a jet of water directed against it, and supplied from a cistern overhead, the water passing off by a pipe into a cistern below. The apparatus can be fixed either in an inlet opening, and so made to propel air into the apartment through an aperture in the wall placed higher than people's heads, and made in a slanting direction, so that the entering air is shot upward toward the center of the room; or it can be used as an extractor, by placing it in an exit shaft, and causing it to draw the vitiated air out. The supply of water can be regulated by taps to the greatest nicety, so that the wheel can be made to revolve at whatever speed is desirable. The entrance pipes are sometimes fitted with a vertical tube containing a box, in which ice can be placed, or a holder for perfume or any deodorant. For smoking rooms it is found advisable to use the apparatus as an extractor only, and to allow the air to come in by means of Tobin's tubes. Dwelling-houses are seldom warmed and ventilated by means of hot-water apparatus, and so I do not think it necessary to enter into a description of the plans by which this may be effected. I need only mention Mr. Pritchett's "miniature hot-water apparatus," if I may so call it, by means of which a single room may be warmed and ventilated. The water starts from a small boiler, the size of an ordinary kettle, which may be placed on a fire anywhere, or heated by a spirit lamp, and passes through a narrow space between double cylinders, the inner cylinders being used for the admission of fresh air, which is warmed in passing through them, or for the extraction of foul air. The water is made to pass through the extraction cylinders first, while

it is hottest, and then through the others and back to the boiler. The cylinders are placed vertically, so that the air is admitted into the room in the proper direction. Other systems of artificial ventilation are suited for large public buildings, but are not adapted for use in dwelling-houses.—*Iron.*

PROCEEDINGS OF SOCIETIES.

THE SARATOGA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(*Continued.*)

INDIAN VIEWS ABOUT THUNDER.

Dr. J. G. Henderson, in the sub-section of anthropology, gave some interesting details of Indian notions concerning thunder and lightning. In the Illinois language the word for thunder *Wa-kiu-yan*, the meaning of which embodies the belief that thunder is caused by the noise made by the wings of a huge spirit-bird. It was thus that these Indians satisfied their curiosity in regard to the philosophy of the phenomena. "An orthodox Dakota Indian," said Judge Henderson, "had the same reasons for believing in the thunder-bird that we have for believing that the whale swallowed Jonah." The author analyzed the aboriginal ideas and superstitions relative to thunder and lightning, the central notions of all being that these manifestations are the direct acts of spirits. Almost all the tribes in the United States believed the thunder to be produced by the wings of a great bird, and that the lightning was the serpents that were invariably connected with the thunder-bird. Among the ancient tribes of the Mississippi Valley, the thunder, therefore, soon became a thunder god, who could be propitiated by sacrifices. The Illinois Indians offered up a small dog when a child happened to be sick upon a day when there was much thunder, supposing the latter to be a cause of the malady. Many accidents, like conflagrations, were attributed to this angry god, and some tribes did bloody penances in propitiation, often burning to death their own children. Statements that the Indians adored the thunder, however, the speaker believed to be erroneous. It was the cause of the thunder that they worshiped, and before which they burned tobacco and buffalo meat, or cut off the joints of their fingers, or threw their children into the fire, when they were overcome with fear. The Peruvians had as an idol a stone that had been split by the lightning. They offered it gold and silver. The natives of Honduras burned cotton-seed when it thundered. Other Southern tribes made no sacrifices on the approach of a storm, but abased themselves in the most abject fear.

The grandest conception of all, the author thought, was that of the Iroquois, who said it was their great god Heno, who rode upon the clouds, split the forest tree with thunder bolts, or hurled stones at his enemies. His home was under the roaring Falls of Niagara. He was a patron of husbandry, and in the Spring he was invoked to water and nourish the growth of their productions, while at the harvest festival they gave him thanks for rain. He was also the avenger of evil deeds, and the Iroquois trembled when his deep shout was heard rolling along the firmament. In Brazil, the thunder and thunder god occupied nearly the same place, and the author dilated upon the connection between this idea and the notions of fire-stones (flint, chert, etc.,) which runs through the whole Indian mythology. Some tribes give this god a sling with which to hurl the stones. In this way he explained the process of thought by which the thunder-spirits came to be the war-gods of the Dakotas and other tribes from whom were received the tomahawk, spear-heads, and other weapons of flint, and those supernatural paints which should protect them from the murderous shafts of their enemies. The wild rice being aquatic and looking like an arrow or spear, is also attributed to the thunder-spirit as to its origin. In Mexico great temples were built upon the sacred spots where lightning had struck. A curious notion among Peruvians was that the preserved bodies of twin children who died in infancy should be worshiped, supposing the father of one of them was the son of the thunder, the origin of the idea being the fact that the thunder-god of that people was one of the celestial twins Apocatequil and Piquerad. This tradition was utilized by Pizarro's missionaries to teach the Indians the doctrine of the Trinity.

In the thunder some of our Western tribes recognized the admonition of the Great Spirit of the Four Winds, that the time of corn planting was at hand. But the main and ruling idea everywhere was that the cause of the thunder was a bird under various disguises. They described its form and abode and food variously. The different shapes and habits were compared and analogies pointed out. Many professed to have seen it, or its feathers, or tracks, and some professed to have found its nest on pinnacles of the rockiest mountains. Usually it was described as compounded of parts of a man and parts of a bird, and it was the young birds which were charged with the mischief when the lightning did any harm. Judge Henderson thought if there was to be found any resemblance to an earthly bird the night-hawk was the species that had originated the idea.

Notwithstanding the thunder was so feared as a god, there were warriors brave enough to defy him, and the Sioux have an association whose exclusive privilege it is to fight the thunder. Instead of propitiating, they resisted in mock-battle the advance of the storm-cloud. The Southern Indians behaved similarly according to old writers. This introduced a very interesting account of "rain-doctors," and the other charlatans who engaged to produce fine weather. Passing over many interesting details, the theories of the manner in which the noise of the thunder occurred next claimed attention, and were discussed minutely in respect to curious details. The paper closed with a recapitulation and general

observations upon the Indian method of reasoning correctly but from false premises.

NATURAL HISTORY.

Dr. C. S. Minott read a paper on the anatomy of the tap-worms, one of a series of investigations upon the lowest worms. The tape-worms are closely related to the planarians and flukes, and the closest homologies can be demonstrated in all their organs. The structure of *caryophyllæus* was specially studied and compared with the other forms; the general conclusion being that the plathelminths cannot be classed together with the nemertean worms, and that their structure is much more complex than usually supposed, and that therefore, they cannot be considered as representing the ancestral type of the higher animals, but at the most a peculiar side branch, arising near the starting point of the evolutionary series.

In his paper on "bud-blight" insects, Dr. W. S. Barnard, of Cornell University, said that his attention had been called to the subject last June by the pear trees in the neighborhood of Ithaca. The ends of the twigs were enlarged and the buds fell off. In Saratoga he had seen the same ruin worked. In all pear-blights there appears a fungus arising from some injury, as excessive freezing, or beetle-boring. If the leaves alone blight with brown or black blotches, the cause is the presence of mites burrowing in the pulp. The death of buds alone cannot be ascribed to any of these adverse influences. The absence of fresh surfaces in the present case showed that the evil was not the work of cut-worms or caterpillars. He found it due to a very inconspicuous insect, well known in Europe as an old offender, under the name of the pear-psylla, (*Psylla pyri*). As this insect had never been described or figured in this country, Dr. Barnard supplied the deficiency and showed drawings. He also described the various methods of discovering their presence. The writer thought "bud-louse" an appropriate name since it is closely allied to the common plant-lice (*Aphidæ*). It is diminutive and and has a gradual and complete metamorphosis. It is provided with wings for flight, and has legs so strong that it can leap like a flea. It lays its pollen-like, almost invisible eggs on the petioles or along the veins of the leaves, (where the adults also, are commonly seen,) each anchored to its place by a filament. During the early life of the louse there exudes from the body a waxy secretion which forms a fibrous mesh on the plant probably to protect the young against the beating winter storms. To manufacture this secretion, and the "honey-dew" which they sqirt upon the leaf, as well as to nourish themselves, an immense quantity of the sap of the tree is consumed. The ants attend and milk these lice affectionately, as they do the aphides. Honey-dew is yielded by both young and old. In Europe this louse, in all its stages, attacks the leaves, blossoms and young shoots, gradually killing the tree. The main injury here is done by the larvæ, which destroy the buds by sucking the sap about their bases. Dr. Barnard thought the damage which this insect was doing to the pear orchards was very large, and liable to be spread widely. It appears to have been imported

into the United States 46 years ago, has done great harm, and is being widely disseminated through nursery sales. It therefore deserves close attention, and Dr. Barnard would be glad of additional observations to aid him in devising some means of successful warfare against it.

In discussing the cat's brain, Prof. Wilder pointed out the progress lately made in the study of the homologies of the features of this animal's brain, with the brain of other animals, and illustrated the matter by black-board drawings. The papers were technical, but the bearings very important. He thought his success in the study of brains was due to the fact that he was able to have perfectly fresh subjects for examination, and suggested that much is yet to be learned about the human brain when better and fresher specimens can be procured.

AN ATLANTIC ATOLL.

"The Geology of Bermuda" was the subject of the most popular paper before the Geological section on Tuesday morning. The author was Dr. William North Rice. The general form of the archipelago suggests the idea that it is a compound atoll, and if this is true, it is a matter of special interest, since it is the only atoll in the Atlantic Ocean. Many authors object to this view, but Dr. Rice thought the objections could be explained away. The rocks in Bermuda are, of course, all limestone, varying in texture. There are three kinds of coral rock—reef-rock, beach-rock and drift-rock. The first is generally easily recognizable, but the beach and the drtft-rock are often distinguished from each other with great difficulty. The geology of the island shows evidence of movements both of of elevation and subsidence. The caves, with floors of stalagmite below the water-level, the relation of beach and drift-rock on the south shore, and the organic remains in some of the rocks prove a former subsidence. It was during a period of subsidence that the atoll was formed in the usual way, at which time, also, the beach-rock was deposited. Then came a period of elevation, laying bare the lagoon and affording an opportunity for the enormous deposit of drifted sand which forms a marked peculiarity of the islands. Third—there was another subsidence, exposing the drift-rock to the erosive action of the ocean and thus producing the cliff shore. It was thought that these successsive changes were complementary respectively to the glacial elevation, the champlain subsidence, and the recent re-elevation of the continent. These oscillations were discussed at length. There are very few fossils in the island, but the general features of the rock formations are full of interest. The paper was made more interesting by the help of an admirable map.

THE HEIGHT OF THE GLACIER.

Prof. J. G. Smock, Asistant State Geologist of New Jersey, read a paper of general interest upon the limits and thickness of the continental glaciation in that State. It referred to the existence of a "great terminal moraine," which has

been described in several of the State geological maps, It runs from near Amboy to Plainfield, thence to Morristown, and thence almost due north, almost exactly along the line of the Delaware, Lackawanna and Western Railroad, to and beyond the Water Gap. This line of elevations rises on the eastern coast to a height of 100 or 5000 feet, but westward the hills rise much higher. From the varying height of these morainal hills Prof. Smock derived an estimate of the front of the great ice sheet. The height of the hill he considered the minimum thickness of the margin of the glacier at that point. But there are better evidences. On certain trap-rock mountains are boulder limits showing the top of ice glacier. These limits vary in different parts of the State, and many figures were given to show this. As a whole, Prof. Smock thought he had evidence to show that the thinnest ice was at the southernmost points, and that it grew thicker as the line of the margin receded northward. Not in New Jersey, but north of there, in the Catskills, it was possible to find many points that evidently had overtopped the glacier. By these investigations he concluded the average thickness of the ice in the Catskill was 3,000 feet. Reasoning from this fact he concluded that the increase of the thickness of the glacier made it cover the Adirondacks and White Mountains completely, leaving the Catskills as the only landmark.

EXPLOSIVE COMPOUNDS.

Prof. Benjamin S. Hendrick, of the United States Patent Office, read a brief paper on explosive and detonating compounds. He mentioned that from seven to nine times as much air should be mixed with street gas to make the most violent explosion. Hence accidents of the gravest sort happened from a very small leak of gas. The explosive compounds which are most in favor for practical purposes at the present day are made with a very small proportion of nitro-glycerine—say from 3 to 20 per cent. The solids that are mixed with the nitro-glycerine serve as a cushion, which prevents too ready vibration, and hence these new compounds are capable of being handled, transported, and used for many purposes which would have been impossible with the liquid.

The Thon-Industri Zeitung describes a sanitary paint for walls, ceilings and the like—one which renders the penetration of fluids or vapors impossible, and prevents the formation of fungi, at the same time being of such stability that it can be washed down with boiling water without injury. This paint is, essentially, a solution of stearate of soda in spirit, in the proportion of about fifty grammes of the stearate to 1,000 of sp. gr. 66. Spirituous solution of soap, of of all kinds and strength, can be applied in a similar manner, but the stearate of soda is far preferable. The paint is said to present an especially handsome appearance, and in the sick wards of hospitals, or in cattle sheds where disease is prevalent, can readily be mixed with disinfecting materials.

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CORRESPONDENCE.

SCIENCE LETTER FROM PARIS.

NEW VIEWS ON DIGESTION — METEOROLOGY OF 1879 — METALLOTHERAPY IN HEADACHE — THE MEDICAL INTERNATIONAL CONGRESS AT VIENNA, ETC.

PARIS, September 27, 1879.

According to Hippocrates, certain aliments are not equally good; following Dr. Leven, certain others are bad for everybody. The latter is head physician of the Rothschild hospital in this city, and is well known for his skill and able writings. He is an experimental practician. Not content with studying his patients, he controls his experience by experiments on animals, a method that cannot be questioned provided the conclusions be correctly drawn. With Dr. Leven, the stomach is the center of health and happiness. We destroy it, he maintains, by eating and drinking aliments that are as dangerous as the poisons of Borgia or the philters of Macbeth. Discard soup; it overcharges the stomach with water, and thus weakens its power to digest essential food. Avoid fatty matters; these induce congestion of the stomach and stop its action. Salmon is a bad fish, because containing too much oil, and that Scotch servants know well, as, before engaging, they stipulate they shall not have to eat that fish more than twice a week. Ragouts are detestable; their spices irritate the digestive tube. Sauces are to be excommunicated, and *pate de foi gras*, truffled, means suicide. Suppress cheese—it is fatty; fruits, for they are acid; ices, as they arrest digestion, and wines and liquors, as they act like so many hot irons. As a compensation, patronize broth, milk, boiled eggs, roast or grilled meat, boiled beef, leguminous vegetables, a little tea and coffee; drinking only water, and as little of this as possible.

Dr. Leven's views may create surprise, yet they are scientifically sound. Their fault lies in their being extreme. He rejects moderation. Where he recommends "do not touch this or that," experience replies, "do so, but sparingly." Cooked meat, without any additions, milk, broth, and some pulverized feculas do not irritate the stomach. All other aliments provoke inflammation or gastritis. Up to the present it was believed that the greater part of the troubles of the stomach were due, not to lesions in the tissues of that organ, but to functional modifications in the nutrition of the tissues, and that these modifications depended more on the state of the individual and his organism than on the organ itself. The latter, with Dr. Leven, is everything. Hence, there exists no individualities, no idiosyncrasies; all are equal before the membrane of the stomach. But the ner-

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vous system is not affected in the same manner, with all individuals; sensations are not equal, nor are respiratory wants identical. The middle state, in which we live, and our occupations affect the stomach in its relations with food. A Parisian would certainly have an attack of indigestion if he lived like a peasant or an Esquimaux; he would fall ill were he to eat as much meat in Algeria as in the capital. These are facts corroborated by ages, and that no experiments on dogs can change. Those leading a sedentary life have not want of fatty food, but the peasant, living in the open air, requires a good deal. Then, in the process of digestion, other organs contribute as well as the stomach. The gastric secretion contains an acid which softens the food, and pepsine, which ferments it, thus preparing it for the action of the other secretions. What Dr. Leven appears to have discovered by his experiments is the important rôle played by the intestines in the work of digestion. Indigestion is not wholly due either to an aliment or an excess of aliments. Individual temperament has its disturbing place there. He is right in ruling that wine and liquors are not necessary to a good digestion; that we eat and drink too much, thus fatiguing the stomach, and adding no benefit to the organism; that we ought to masticate slowly and allow the food to be well incorporated with saliva, and thus obviate subsequent drinking. The doctor is equally correct when he proscribes veal, mushrooms, truffles, ice, stews, and all dishes having an excess of fat and sugar. He is too severe in condemning spices. At all times meals ought to be taken at regular hours, and their number diminished as we advance in age. It is good also to indulge in a moderate walk after meals, to burn what we have consumed, for, as Chomel has truly remarked, we digest as much with the legs as the stomach.

Another medical authority states that he invariably recommends sporting to those of his patients who are suffering from nervous affections, melancholy, or hypochondria. After a light breakfast on soup or coffee, they should set out early, and and consider their bag made for the day by noon; if perspiring, never rest in a damp or too shady place, as such might quickly produce inflammation of the lungs or rheumatism. To neutralize the sting of a gnat or mosquito, French sportsmen rub the part affected with a little *cerumen*, that is, the wax of their ear, extracted by the little finger. It is an effectual cure.

Meteorologists are still occupied with the late wet and cold summer, during which, according to M. Renan, as registered at his observatory in the Park of St. Maur, outside Paris, the readings of the thermometer during July last corresponded to the summers of 1758, 1795, and 1816. What is not less remarkable, the direction of the winds were nearly the same. The low temperature this season has not accompanied the northwest winds, but those from the west and southwest, which are naturally warm. M. Renan explains the matter as the consequence of the winds of Africa instead of passing westward, according to habitude, having deviated to the east of Europe. A corresponding phenomenon occurs at Senegal; the warmer the upper part of the river, the cooler is it at the sea side. M. Renan believes that severe winters are not the result of arbitrariness, but are constituted by groups

of four or six around one more vigorous, and which he calls the central winter. He attributes the grouping to cosmical causes; perhaps deviations in the march of the winds might be nearer the truth. In any case, the alteration in the direction of the winds this summer has produced exceptional migrations of butterflies, which have invested the west of Europe since June, going southward. In some cases the sky was obscured by their passage, and they formed singed masses at the base of lamp-posts. They flew in groups, at the rate of ten miles an hour; if they encountered a wall, the column rose vertically till it was crossed; then, after a moment's hesitation, the march southward was resumed without a stop to repose on a flower. Strange, no butterfly of the same species in the locality over which the group passed joined the migration.

A student school-mistress, aged 16, was admitted into hospital, suffering from seuvre headache; she went to bed, and in the morning when she awoke she was completely blind. Dr. Abadie perceived that the surface of her body had become insensible; the forehead, neck, arms, and limbs, when touched with a lance, felt no sensation; no blood even flowed. He tried Dr. Burg's method, metallotherapy, and placed three pieces of gold on the left temple. In the course of fifteen minutes the patient commenced to see indistinctly; at the end of half an hour, perfectly, but only with the left eye, the right remaining refractory to the metallic treatment. The patient was next placed on the insulated stool of an electric machine, and some sparks were eliminated from the neighborhood of the orbit of the eye. In a quarter of an hour an amelioration was apparent, and continuing the plan every second day during a week, sight was restored.

M. Young has been studying the effects of poison on crustaceæ. Lobsters, cray-fish, and crabs are less susceptible to the effects of poison than vertebrate animals. They live very well in a solution of strychnine, because they eliminate it, but nicotine acts as rapidly on them as on us. New colors have been extracted from cabbage and coffee. Another is now announced, a magnificent red called *palmelline*, and obtained from an infusion of the red lichen which grows at the base of whitewashed walls, in damp places. The lichen resembles coagulated blood, and the structure of the little plant is very analogous to that of the blood of animals.

The ancients regarded the ocean as the cradle of life, and yet they only knew it from the beach; they had no means to sound its depths. Had they, it would have been found that the occupants of the ocean do not inhabit indifferently the depths. Some animals, as can be seen by the reflux of the tide, live about one yard below the mean level of the sea, others at three or six. The same remarks apply to the vegetation. During a neap tide quite new varieties of beings are revealed. Many mollusks that live under the tropics at small depths, extend to the coast of Norway and Newfoundland, in the profoundness of the Atlantic—at the entrance of the Arctic Ocean. In the Lake of Geneva, which is very profound, quite new species of animals have been dredged, some without eyes. M. Marion has been dredging the coast line of Marseilles, and has found many

rare specimens of plants and animals, those being largest which were taken at the greatest depths. The French Government contemplate appointing him to examine the whole coast of France, especially the Gulf of Gascony, which is a steep ravine, and its sides ought to be as rich in sub-marine life as the flanks of the Andes are in diversified vegetation.

In the Department of the Seine, of which Paris is the capital, the police registered during 1878, 508 mad dogs and 3 cats; 103 persons were bitten, of whom 36 were children; one-third of the cases were fatal. M. Galtier has devoted years to the study of rabies and concludes it to be incurable and surely mortal. He finds that rabbits can be inoculated with the virus, and in their case the madness declares itself more rapidly—from 4 to 18 days, than in that of other animals. Also, the saliva of a mad dog retains its virulence even if kept in water for 24 hours; hence, caution should be exercised toward those places where the diseased animals drink. It is a popular error to believe they shun water; they have to do so when the malady paralyses the muscles of the mouth.

The Medical International Congress at Amsterdam was as successful as it was interesting. The matters most debated were those connected with miasmas, ferments and germs. It is admitted that the latter exist in the air, are infinitely small and organic. Do they act by their chemical composition, as an altered organic substances, or are they microsopic beings, seeds, which in developing become pernicious? Wounds when treated by the antiseptic process—that is, excluding the air in their dressing, heal more surely and rapidly, but wounds exposed are cured not the less. Dr. Verneuil of Paris, advocates the necessity of preparing constitutions for operations—in diabetes for example, where the slightest operation may be fatal. He also recommended cancer patients to avoid the surgeons. Dr. Crosz of Vienna alluded to the terrible increase of syphilitic diseases in that city and among all classes of society. It is to servants, that is to say, to clandestine prostitution, that the evil is due; in one instance a whole family was infected by the utensils passing through the hands of a syphilitic servant. He urged that no servant be hired without the "moral" certificate being corroborated by one from a doctor. A Belgian physician claimed to cure phthisis by electricity; the Congress examined the more serious question of the efficacy of the phosphate of lime in consumption, to replace that so largely eliminated in theexpectorations. It was confessed that the utility of the phosphates was not clear. M. Marey demonstrated that shoes, &c., with little or no heels, are best, and that their soles ought to be larger than the feet. M. d'Arsouval exhibited a perfect instrument for measuring animal heat, during health, abstinence or disease. Another instrument registered respirations, during sleep, and which are fewest about five o'clock in the morning, and M. Markowitch has found the douche superior to the cold bath in typhoid fevers.—*F. C.*

XUM

ASTRONOMY.

ASTRONOMICAL NOTES.

FROM THE OBSERVATORY OF VASSAR COLLEGE.

(The computations in the following notes are by students of Vassar College. Although they are merely approximate, they will enable the observer to recognize the planets. M. M.)

POSITION OF PLANETS FOR NOVEMBER, 1879.

Mercury.—On November 1st Mercury rises at 8h. 4m. A. M., and sets at 5h. 27m. P.M.

On November 30th Mercury rises at 8h. 43m. A.M., and sets at 5h. 29m. P.M.

Mercury will be in conjunction with the moon on the morning of November 15th, and will be between the crescent moon and the horizon on the evening of that day.

Venus.—On November 1st Venus rises at 3h. 9m. a.m., and sets at 3h. 7m. p. m.

On November 30th, Venus rises at 3h. 8m. a. m., and sets at 2h. 33m. p. m.

Venus will rise nearly with the waning moon on the 10th, being in conjunctionwith the moon at 8 a. m. Although past the position of greatest brilliancy, Venus will be very conspicuous in the early morning during November.

Mars.—On November 1st, Mars rises at 5h. 33m. p. m., and sets at 7h. 51m. a. m. of the next day.

On November 30th, Mars rises at 3h. 5m. p. m., and sets at 5h. 12m. of the next morning.

Mars is in the best position in November, coming to the meridian at midnight of the 9th, at an altitude of more than 66°. Mars is in conjunction with the moon at midnight of the 26th.

Jupiter.—On November 1st Jupiter rises at 2h. 20m. p. m., and sets 55m. after midnight.

On November 30th Jupiter rises 29m. after noon, and sets at 11h. 10m. p. m.

If we examine the group of Jupiter satellites between the hours 8 and 10 of the November evenings we shall find the first satellite is hidden by occultation on the 5th, 12th, 21st and 28th, for some portion of this time; the same satellite is unseen, because in transit, on the 13th and 20th; it is unseen at the same hour on the 21st, because it is in the shadow of the planet.

The second satellite is passing across the face of the planet in transit during these hours on November 8th and 15th; it is in the shadow of Jupiter on the 17th and 24th.

The third satellite may be seen to enter upon the face of Jupiter between 9 and 10 p. m. of November 3; it will come out of the shadow of Jupiter between 8 and 9 p. m. of November 7th, and it will disappear by going into the shadow of Jupiter on the 14th.

The fourth satellite, which is the farthest from Jupiter, will reappear from behind Jupiter on the 27th, between 8 and 9 p. m.

All these changes are very easily seen with a small telescope.

Saturn.—On November 1st Saturn rises at 3h. 52m. p. m., and sets at 4h. 4m. of the next morning.

On November 30th, Saturn rises at 1h. 55m. p. m., and sets at 2h. 4m. of the next morning.

The ring of Saturn is now opening to our view, and with a small glass the spaces between ring and ball can be seen on both sides. The satellite Titan can be seen, and on November 7th will be found (with an inverting glass) on the right of the planet. It is possible that Rhea may be seen with an object glass of 4 inches diameter.

With the glass at the Observatory of Vassar College, on October 6th, the five small satellites interior to Titan were seen; Mimas, which is a very difficult object even with a large glass, was seen to move rapidly along the edge of the ring.

Uranus.—On November 1st, Uranus rises at 1h. 25m. a. m., and on November 30th at 11h. 31m. p. m.

Uranus is still among the stars of Leo, and not yet well situated for evening observers.

Neptune.—Neptune is in good position, but can be known as a planet only by aid of a good glass. It is among the stars of Cetus.

It rises on November 1st at 5h. 3m. p. m., and on November 30th at 3h. 6m. p. m. *Scientific American.*

BOOK NOTICES.

THE MOUND BUILDERS. By J. P. MacLean, pp 243; Illustrated; Robert Clarke & Co., Cincinnati, O., $1.50.

Mr. MacLean is the President of the Archæological Society of Butler County, Ohio, and author of several works on Archæology. He has long been an ardent student and investigator, and having in his State one of the most prolific fields for original inquiry and research in the country, his experience is large and valuable. The results of his investigations among the ancient works of the Mound Builders of the Ohio and Mississippi Valleys, and especially in Butler County, are given in this small book in a particularly interesting, modest and convincing manner. Some of the chapters, such as those on their Advancement

in the Sciences, their Civilization and their Antiquity, contain new facts and will interest even old students of Archæology.

Everything which contributes in any respect to the solution of the long unanswered questions—who were they and what became of them? is valuable, and this work certainly possesses more than ordinary merit in this respect.

The mechanical part of the work has been handsomely done by the publishers.

THE INSECT WORLD, OR BORN IN PRISON. By Julia P. Ballard; pp 97; square 12 mo. Robert Clarke & Co., Cincinnati; $1.00.

This is a handsomely printed and beautifully illustrated volume, written in a fascinating style for the information, ostensibly, of children, but it contains much that will be of value to grown persons also.

The study of butterflies and moths is the principal subject treated, beginning with instructions how to catch them, how to handle and care for their eggs, larvæ, &c., with careful, minute, but untechnical directions for their examination and classification. The illustrations are very fine and are alone worth the price of the book.

REPORT OF THE COMMISSIONER OF EDUCATION for the year 1877. Government Printing Office, Washington, D. C.; pp 644; octavo.

An immense amount of work has been done and well done by the Commissioners' office in preparing this extremely complete and compendious Report, and so valuable has it been found that Congress at its last session ordered an extra edition printed. These have been thoroughly distributed and will be found of great interest to teachers and all classes of people devoted to or interested in education. At the close of the Report proper follows abstracts from the Reports of school officers of States, Territories and cities, statistics of all classes of schools and colleges, institutions of learning of all kinds, asylums, libraries, improvements in school furniture and apparatus.

Very few public documents deserve so careful a perusal by the people at large as this.

THE LIFE AND TRAVELS OF GENERAL GRANT. By J. T. Headley. 750 pp. octavo. Hubbard Bros., Philadelphia, 1879.

This work is, like all of Headley's writings, graphic in its descriptions, accurate in its statements, and as entertaining as a romance. It is designed to furnish a complete account of the life and remarkable public career of General Grant, and to take the reader with him in his brilliant tour around the world. This is a subject for which the pen of Headley is peculiarly adapted, and he has made the most of his opportunities. To those wishing a cheap and popular volume, which will at the same time be perfectly reliable, nothing can be better. For sale by John Kimmons, Agent.

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A LECTURE ON PETROLEUM By Prof. P. Schweitzer, Ph. D. Statesman Book and Job Print., Columbia, Mo., 1879.

This is a 64 page pamphlet by Prof. Schweitzer, Chemist of the Missouri State University, at Columbia, Mo., and is a very complete and accurate digest of the subject of Petroleum, including its history, commercial importance, uses and danger, with an appendix giving statistical information as to its production, amount exported, quality of different oils, chemical compounds, etc.

Prof. Schweitzer has made up a very interesting and valuable monogram; one which will be highly appreciated by chemists and those dealing in and handling petroleum and its products.

PUBLICATIONS RECEIVED.

Laboratory notes from the University of Cincinnati; X. Some New Salts of Aniline, by Miles Beamer and F. W. Clarke; XI. Note on Lithium Picrate, by same; XII. Preliminary Notice of a new Volatile Alkaloid, by W. L. Dudley.

Reminiscences of Quantrell's Raid upon the City of Lawrence, Kansas, compiled and arranged by John C. Shea, editor and publisher, Kansas City, Mo.

Atti della Societa Toscana di Scienze Naturali, CXIII.

SCIENTIFIC MISCELLANY.

SCHLIEMANN'S LATE EXPLORATIONS.

Henry Schliemann's excavations, made from March 1st to June 5th, 1879, in the "Tombs of the Heroes," on the coast of *ancient Troas*, resulted in some important discoveries. Six of these tumuli were explored. The tomb of Ilus proved to be an agglomeration of earth. The tomb of Ajax, near the Rhœtean promontory, contained a few horse bones only. The greater portion of this artificial hill had been destroyed by the sea in a southerly hurricane. Only a few fragments of Roman brick were found in the tumulus near the southern extremity of New Ilium, and the conical mound on the sea-shore between the village of Yèni Keni and Yèni Sehir was found to consist of a natural sandstone rock. The fifth tumulus stood on a natural elevation 83 feet high, and proved to contain a gigantic quadrangular tower, probably of the Roman imperial epoch, standing exactly over a circular stone inclosure 4 feet 4 inches in height, and 34 feet in diameter, which consisted of well-fitted, beautifully cut polygons. This inclosure is supposed to be a sacred shrine, erected during the Macedonian epoch, the marks of an iron pick hammer being plainly visible on the polygons. The sixth tumulus, 66 feet high, contained ancient pottery, which was thought to be older yet than the one discovered at Hissarlik. A fragment of a vase bottom,

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with incised characters, was sent to Professor Sayce, of Oxford, who wrote to Dr. Schliemann: "I do not think it is a real inscription, but it seems to me a bad copy of a cuneiform inscription, made by some one who did not understand the latter, like the bad copies of Egyptian hieroglyphics made by the Phœnicians." In the great trench excavated at Hissarlik, a large number of manufactured objects, large jars, owl-headed vases, an ivory seal, a trachyte idol, a treasure consisting of gold and silver rings, ear ornaments, etc., were exhumed. The orientalist, Emile Burnouf, and Professor Virchow were present at the excavations. A geological investigation of the plain of Skamander River proved that there were no marine, but only fresh water deposits, and that the theory prevailing among the ancient Greeks, that the sea had once formed a deep gulf in the plain of Troy, was unfounded. On June 19th, Schliemann left for Paris.—*American Antiquarian.*

LAWS OF ATMOSPHERIC ELECTRICITY.

Atmospheric electricity presents daily in Piedmont two maxima following the rising and setting of the sun, at an interval of some hours. These two maxima are separated by a minimum, which follows the passage of the sun over the meridian of the place. As regards the annual fluctuation, the maximum value of the atmospheric tension falls in February, and the minimum in September. Before and after storms the electrometer almost always marks zero, but during their passage or proximity the tension is very great. Rain and snow increase tension more slightly, and are often preceded and followed by electric diminution. The action of fogs, hoar frosts, and of the formation of clouds increases atmospheric electricity, though to a less extent than that of rain and snow. In calm and hot weather the lowest values are observed. South and especially southeasterly winds increase the electricity of the air; north winds have an opposite effect. Rain and snow are accompanied by negative electricity, at least as often as by positive. The same proportion holds good for storms, and to a less extent for rain and snow. Negative electricity is generally due to storms or rain at a distance, to the formation of clouds, or to a polar aurora. In the normal conditions of the atmosphere, electric tension decreases with altitude —*P. F. Denza.*

A NEW FIRE EXTINGUISHER.

Manufacturers of patent fire extinguishers are not likely to give a vote of thanks to the gentleman who first accidentally discovered, and then confirmed by numerous experiments, the fact that crude ammonia water, or gas-liquor, as it is called, acts like a charm in extinguishing a fire, no matter how inflammable may be the material upon which the flames have obtained a hold. The discoverer now recommends that owners of cotton mills, and other establishments where there is ordinarily great danger from fire, should have on their premises a stock

of about 1,000 gallons of this gas-liquor, stored in a tank or old boiler, mounted on brick work, and at such an altitude as to give a good jet service in case of fire. There is no reason why this cheap and efficient preventive of destructive conflagrations should not be generally adopted. It would seem that the extinguishing power of the liquor would increase with the augmentation of heat, as in all probability the ammonia would be more rapidly decomposed, freeing hydrogen and nitrogen gases in such quantities as would help to swell the volume of non-supportive gas, displacing the air, and so choking out the combustion. The theory of the discoverer seems reasonable, and is given for what is worth.

Boston Journal Commerce.

FLOWER GARDEN AND PLEASURE GROUNDS.

As the fall planting season is upon us, it maybe of service to remark that few persons seem aware of the great variety of the material with which their gardens may be adorned.

This winter, unless unusually severe, will be a very favorable one on vegetation, and those who plant at once will no doubt have unusual success. Even plants which have not been transplanted, but are usually regarded as somewhat tender, will probably suffer but little; still, protection of such plants will be in order as usual. It may be as well to remember that keeping off the cold dry winds is often a sufficient protection. Wherever earth can be used, as for instance in the case of small things, there is nothing like it for protection. Half hardy vines can easily be bent down and lightly covered, and small roses can have the young tops cut back and the earth drawn over them. When large they may be taken up, laid on their sides, and replanted in the Spring. In other cases used straw or some other light covering.

We have already spoken of the value of lilies and other Summer flowering bulbs in gardening, and that the Fall is the time to replant and care for them. The hardy or Holland bulbs, as they are often called, because mostly imported from Holland, where they are grown extensively and thrive better than in any other country, are almost the only ornament of the garden in very early Spring. Commencing with the Snowdrop, in this section in March or early April, followed by the Crocus, Hyacinth and Tulip, they make a most interesting sucession during the months of April and May, when but for them the garden would be bare enough. In addition to this they are unrivalled for culture in the house during the Winter months. As nearly all can be grown in so many ways—in pots, or baskets of sand or moss, or in vessels of water—they are an almost endless source of interest and amusement in every stage of growth. With a little moss from the woods or swamps, a few quarts of sand, some pots or a shallow box or two, and a few dozen Crocuses, early Tulips, Hyacinths and Narcissus, any one is prepared for a pleasant little Winter garden. Of course, a few Hyacinth glasses are desirable, but not essential. Very pretty boxes can be made with a little taste and patience, with some sticks and bark from the woods.

In addition to the kinds above named, the Anemone and Ranunculus are beautiful Spring flowers for all who have rotten cow manure to fertilize the ground with, and will give the beds a little protection from the severest weather. We are also very partial to the old Crown Imperial, of which there are now several varieties of red and yellow.

Many kinds of hardy annuals flower much better next Spring, when sown at this season of the year. A warm, rich border should be chosen, and the seed put in at once. Early in Spring they must be transplanted to the desired position in the flower border.

Few things are more valued in Winter than a bunch of sweet violets. A few may now be potted, and they will flower in the window toward Spring; or a small bed of them may be made in a frame, which should be protected by a mat from severe frost. To have Pansies flower early and profusely in Spring, they may be planted out in a frame, as recommended for the Violet.

Herbaceous hardy border flowers are often propagated in the fall by dividing the roots; but, unless it is convenient to protect the newly-made plants through the winter, it is better to defer this till spring, as the frost draws out of the ground and destroys many. Where it is now resorted to, a thick mulching of leaves or litter should be placed over the young stock when transplanted.

Chrysanthemums now in flower should have their names and colors rectified, against the time when in Spring they may have to be replanted, when they can be re-arranged with accuracy and satisfaction, according to the owner's taste.

Amongst the pretty effects which we have seen this year, have been several attempts at forming Winter gardens of evergreens. It was suggested in England a few years ago, that the massing system of growing flowers in Summer was objectionable in this, that it left the beds naked through the Winter. To remedy this, they had a reserve garden of evergreens, from which the plants were taken every year after the frost had killed the flowers, and set in the places where the flowers were. This makes the flower garden look green at least during the Summer season. This reserve garden of evergreens is usually put into an out-of-the-way place, and does not look very inviting in the Summer time. In the case we have reference to, the reserve garden had the evergreens set rather wide apart and the spaces between filled with Coleus, Achyranthus, and other colored and variegated leaves. The effect was very pretty indeed.

Over fifty patents have been obtained for cow-milkers, thirteen in England and forty in America. These machines have been divided into three classes. First, tube-milkers; second, sucking-machines; third, mechanical hand-milkers. The first are tappers, the second suckers, and the third squeezers and strippers. Some devices are formed of combinations of these classes. As yet no one machine can be considered a success, as notwithstanding the apparent success in single milkings, the constant use seems to forward a tendency toward drying off the cow.

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Barrels made of paste-board have been introduced for the packing away of woolens and furs. These are seamless, and regarded as moth proof. The head, which fits down snugly, is the only available entrance for the moth, and directions are given to paste a layer of brown paper over this almost invisible line when the barrel is packed.

Mr. T. L. Phipson reports to the French Academy of Sciences the discovery of a new rose-red coloring matter, which he has succeeded in extracting from the little blood-red alga, found at the base of damp walls. It resembles no other known color, and exhibits considerable analogy with the hæmaglobine of the blood. It is the first time that a substance of this kind has been met with in the vegetable kingdom.

EDITORIAL NOTES.

THE twelfth annual meeting of the Kansas Academy of Science, of which Prof. B. F. Mudge is president and Prof. A. E. Popenoe secretary, will be held at Topeka, Thursday and Friday, November 6th and 7th, 1879. The business meeting will be at 3 o'clock p. m., of the 6th, at the office of Dr. A. H. Thompson, Kansas avenue, and the other meetings at the Senate Chamber of the State House. Numerous papers on scientific subjects will be presented. A full attendance of the friends of science is requested.

THE winter course of lectures before the Leavenworth Academy of Science was opened on the evening of October 23d, with an address by Dr. Tiffin Sinks upon the subject of a Visit to Vesuvius and Pompeii. The house was crowded to overflowing by the most intelligent people of Leavenworth, and they were well entertained.

The remainder of the course is as follows:

November 6th, Prof. W. E. Coleman—"The Records of Creation, Genesaical and Scientific."

November 20th, Prof. F. A. Fitzpatrick—"Moral Education in the Public Schools."

December 4th, Dr. W. W. Backus—"The Sun."

December 18th, Judge S D. Lecompte—"Skepticism, or the Isms of the Day."

January 8th, Prof. F. H. Snow, Kansas University—"Pre-Historic Man."

January 22d, Judge Robert Crozier—"Non-Partisan State Rights."

February 5th, Prof. Lawrence Hawn—"Belief as an Element of Science."

February 19th, Judge D. J. Brewer—"Municipal Indebtedness."

March 5th, W. S. Burke—"American Jurisprudence."

March 19th, Prof. J. M. Greenwood—"Value of Definitions."

April 2d, Dr. R. J. Brown—"The Mound Builders of Fort Leavenworth."

April 16th, Prof. B. F. Mudge, Yale College—"Geology."

April 30th, Prof W. W. Grant—"The Language of the Future."

Hon. Thomas P. Fenlon, Prof. H. D. McCarty, Rev. W. N. Page, Rev. T. W. Barry, and several other gentlemen from abroad, are expected to speak during the season, but are not yet prepared to announce dates or subjects.

THE regular winter session of the Kansas City Academy of Science commenced on Tuesday evening, October 28th, the proceedings consisting of papers upon Personal Hygiene and the Hygienic Construction of Buildings, by Prof. George Halley, and upon Potable Waters of Cities, their Beneficial and their Noxious Qualities, by Theo. S. Case. The

following programme for an extra course of lectures was arranged:

Pres't S. S. Laws, Missouri State University; Prof. F. H. Snow, Kansas University; Prof. F. E. Nipher, Washington University; Rev. Richard Cordley, Emporia, Kansas; Prof. G. C. Swallow, Missouri University; Prof. J. T. Lovewell, Washburn College; Prof. B. F. Mudge, Manhattan, Kansas. This course will commence in November. The precise dates and topics will be announced soon.

PROF. GEO. T. FAIRCHILD, who for many years has occupied the chair of English Literature in the Michigan State Agricultural College, has been elected President of the Kansas Agricultural College, at Manhattan. Prof. Fairchild is an able teacher and business man, and we congratulate the College Regents on choosing so efficient a president, as well as the Professor on this recognition of his abilities.

The professor chosen to fill the chair of Horticulture and Botany is a well known gentleman from the vicinity of Topeka, Mr. E. A. Popenoe, who is an enthusiast in entomology, and will carry into his work the zeal which his love for the study of natural history has created.

ON Sunday, September 28th, Prof. John Wise, the aeronaut, ascended in a balloon from Lindell Park, St. Louis, Missouri, with one companion, and has not since been heard from. The balloon was last seen about half-past eleven the same night by an engineer of the Lake Shore and Michigan Railroad at Miller's Station, thirty-five miles from Chicago. It was plainly visible in the bright moonlight, not very high, and was drifting northeastward over the Lake.

Prof. Wise was born in Lancaster, Pennsylvania, in 1808, and had made a practical study of aeronautics for over forty years. His last ascension was his three hundred and sixty-third. The fatal balloon was the "Pathfinder," and is described by the aeronaut's son, Charles E. Wise, as new and strong. It had never been used before. The bag was of material made expressly for it, and of the best quality for the purpose. The basket was one of the strongest, and was commodious.

The body of his companion, Mr. Geo. E. Burr, has been found in Lake Michigan, which leaves very little doubt of Prof. Wise's fate.

WE have received from Prof. G. C. Broadhead some interesting Notes on the Surface Geology of Southwest Missouri and Southeast Kansas, which we will give to our readers in the December issue.

PROF. E. L. BERTHOUD, of the Colorado School of Mines, writes as follows under date of October 8th:

"I have made, this summer, an exhaustive survey from Georgetown to Leadville and Lake Fork of Gunnison River, some 260 miles in all; have surveyed and leveled over seven passes in the Rocky Mountains, and can now say that, except South Pass, I have been over and examined every pass in these mountains, from Sun River Pass, Montana, latitude 48°, to the Cochetopa Pass, in latitude 38°."

PROFESSOR SPENCER F. BAIRD, U. S. Fish Commissioner, has recently received a well deserved compliment from the French "Société d' Acclimation," in the shape of a handsome gold medal appropriately inscribed.

THE readers of the REVIEW will do well to bear in mind the great meteoric shower of November 13th, predicted by Prof. Tice in the October number. If at all approximating what he anticipates, it will be a phenomenon rarely observed twice in a life-time.

URIAH A. BOYDEN, of Boston, bequeathed the greater portion of his property for the purpose of making scientific investigations of the properties of caloric and the phenomena relating thereto. When such investigations have been thoroughly made, he provides for observatories on prominent peaks, for the gratuitous use of students of astronomy and kindred sciences.

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WE learn from Mr. W. C. Evans, who has ust returned from Sedalia, that there is great interest being taken by the citizens in the discovery of mastodon and other prehistoric remains near that place. About ten wagon-loads have already been taken out by Messrs. Blair, representing, as is believed, no less than seven different animals, some of which, however, are probably recent. Some of the mastodon bones are very perfect, and undoubtedly belonged to a very large individual.

THE authorities at Madrid say the loss of life by the floods in the districts of Murcia, Allicante, Almeria and Carthagena will exceed two thousand.

THE Italians of St. Louis celebrated the discovery of America by Christopher Columbus on October 12th, in a very enthusiastic manner, all the different societies turning out for a grand parade with appropriate banners, and orations by the prominent leaders, the whole winding up with a grand ball in the evening.

NOTES ON THE PERIODICALS.

PATRONS of the REVIEW will bear in mind that they can save money in subscribing for any of the magazines of this country or England by remitting through this office.

THE contents of the *Popular Science Monthly* for November are as follows: The Recent Progress of Solar Physics, by Professor S. P. Langley; Diseases of Wild Animals, by Prof. Jean Vilain; On Radiant Matter, I., by William Crookes, F.R.S. (illustrated), John Stuart Mill, IV., by Alexander Bain, LL.D.; Ocean Meteorology, I., by Lieut. T. A. Lyons, U.S.N. (illustrated); The Study of Physiology, by P. H. Pye-Smith, B.A., M.D.; Mythologic Philosphy, II., by Major J. W. Powell; The Evolution of a New Sense, by William A. Eddy; Why do Springs and Wells Overflow? by Nelson W. Green (illustrated); Mars and his Moons, by Prof. John Le Conte; Intellectual Straining in Authorship; Respecting Rubbish; A Reply to "Fallacies of Evolution," by George J. Romanes; The Inauguration of Arago's Statue; Sketch of Dr. Asa Fitch, by E. P. Thurston (with portrait); Editor's Table; Literary Notices; Popular Miscellany; Notes.

Harper's Monthly and *Harper's Weekly* are looked for by their readers with as much eagerness as ever, and are always found fully up to their high standard, which is on a constantly sliding upward scale. Additional excellences and improvements are promised for 1880.

THE paper in *Appleton's Journal* for November likely to attract most attention is one containing a number of extracts from the "Memoirs of Madame de Rémusat," the appearance of which is the literary event of the day in France. Madame de Rémusat was maid of honor to Josephine, with whom she remained from 1802 to 1808, and so followed her in her imperial fortunes. The work referred to will shortly appear in Paris, but chapters from it have been published in advance in the *Revue des deux Mondes*, from which the extracts given in *Appleton's Journal* have been translated. This foretaste of the book will be generally welcomed. There are numerous other interesting papers, notably one on "The Malakani," a sect of so-called Spiritual Christians of Russia, which describes the striking features of their mode of life and their belief. The editorial department is always good.

THE November *American Naturalist* presents the following articles to its readers, viz: How our Ancestors of the Stone Age made their Implements, by B. B. Redding; Colorado Plants, by Isaac C. Martindale; Mold as an Insect Destroyer, C. G. Siewers; The Fertilization of our Native Species of Clitoria and Centrosema, Wm. Trelease; Recent Literature; General Notes on Botany, Zoölogy, Anthropology, Geology and Palæontology, Geography and Travels, and Microscopy; Scientific News, etc.

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THE *Atlantic* for December will contain a paper of marked interest and special value, embodying very recent observations on Farming in Kansas and Dairy Farming in Illinois, and presenting some startling facts with regard to the present and future of agriculture in the West. The readers of Rosamond and the Conductor will be curious to see the sequel of that affair in the Conductor and Rosamond. A very charming paper on Puritan Boston, founded on unpublished passages of the Sewall Diary; a sketch of three interviews with John Brown by Hon. W. A. Phillips, of Kansas, formerly correspondent from Kansas of the New York *Tribune;* an article on the National Board of Health; the first part of a curiously imaginative story in two parts, and a long poem of striking power, with a critical and biographical study of Turgenef from original sources, are some of the other attractions.

MAJOR BURKE, of the *Western Homestead*, has associated with him as co-editor and publisher our young friend D. A. Beckwith, who has been a newspaper man for several years, and is a live, active man and a sprightly writer. The *Homestead* has been a good magazine from the start, but this addition to its editorial force will still improve it.

THE Boston *Literary World* has absorbed the *Epitome of Literature*, published at Philadelphia, and will continue to be, as heretofore, the leading paper of its kind in the United States. Fortnightly, $2.

THIS excellent magazine, the Kansas City REVIEW OF SCIENCE AND INDUSTRY, now in its third volume, comes to us each month replete with the latest and best thought on scientific matters. Purely a western enterprise, it is a fitting reflex of the intelligence and genius of the empire that is so rapidly building up in this Mississippi valley. It has received recognition at the hands of the best writers in the domain of science, both at home and abroad; in fact, is sought for as one of the best mediums in the country for the promulgation of "the latest recorded triumphs of mind over matter." We urge scientific students to give this magazine a place on their tables, for without it they cannot keep pace with the development of science in the New West, which is now the great field of research.--*Chronoscope.*

THE articles in the Kansas City REVIEW OF SCIENCE AND INDUSTRY are by the best writers, and contain much of interest to the philosophical and industrial world. This serial only requires to be known to have a wide circulation, and should be read by every intelligent and educated person. We heartily recommend it to our readers.—*Exporter and Importer.*

The *North American Review* for November opens with a series of articles by Julia Ward Howe, Elizabeth Cady Stanton, Thomas Wentworth Higginson, Lucy Stone and Wendell Phillips, under the title, "The Other Side of the Woman Question." The second paper is an attack on Malthusianism, Darwinism and Pessimism, by Professor Francis Bowen, of Harvard College. The writer declares that Malthusianism has no advocates, that Darwinism stands completely refuted by the facts of nature, and that in the despair of Pessimism we witness the worst consequences of the Malthusian theory. This essay will be enjoyed by those who like discussion in which no quarter is given or taken. "A page of Political Correspondence," which follows is a collection of letters written by Mr. Stanton to ex-President Buchanan at the beginning of Mr. Lincoln's administration, and for the first time given to the public. Part IV of "The Diary of a Public Man" treats chiefly of the relinquishment of Fort Sumter. Mr. Seward's negotiations with Virginia, the progress of events at Richmond and Montgomery, and the plan of a peace convention. Professor Arthur L. Perry contributes a clearly written essay on "Tariff Reactions," in which he insists that every form of protection must operate calamitously in time. The concluding article is a review of "Some Recent Works of Fiction," by Edward Eggleston.

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OBITUARY NOTICE.

DEATH OF PROF. B. F. MUDGE.

The following dispatch was received on the evening of November 21, after our last form was in print:

Special dispatch to the Journal.

MANHATTAN, KAS., Nov. 21.—Professor B F. Mudge died suddenly at his residence in this place this evening, of apoplexy. His funeral will take place at two o'clock Sunday afternoon.

Prof. Mudge was the leading scientist and geologist of the state, and had done more than any other man to investigate the geological formation of his adopted state. In his death science loses a devoted follower.

As a personal friend we prized no man in the country more highly, while as a teacher we had long since learned to revere and esteem him above all western men.

An extended notice of his life and services to science will appear in the January issue of the REVIEW.